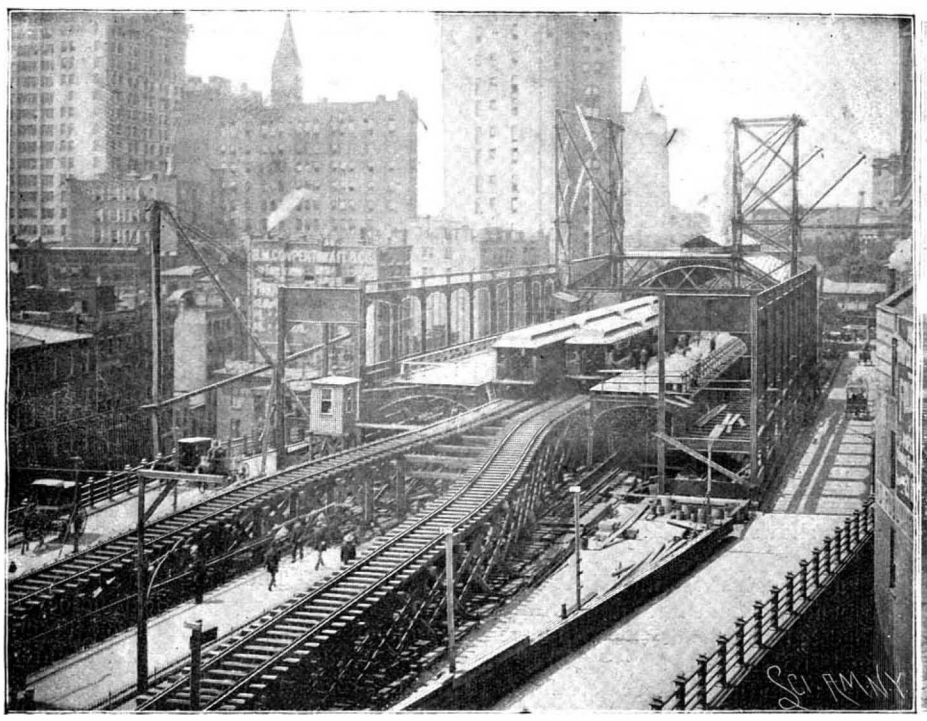
SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class matter. Copyright, 1895, by Munn & Co.]

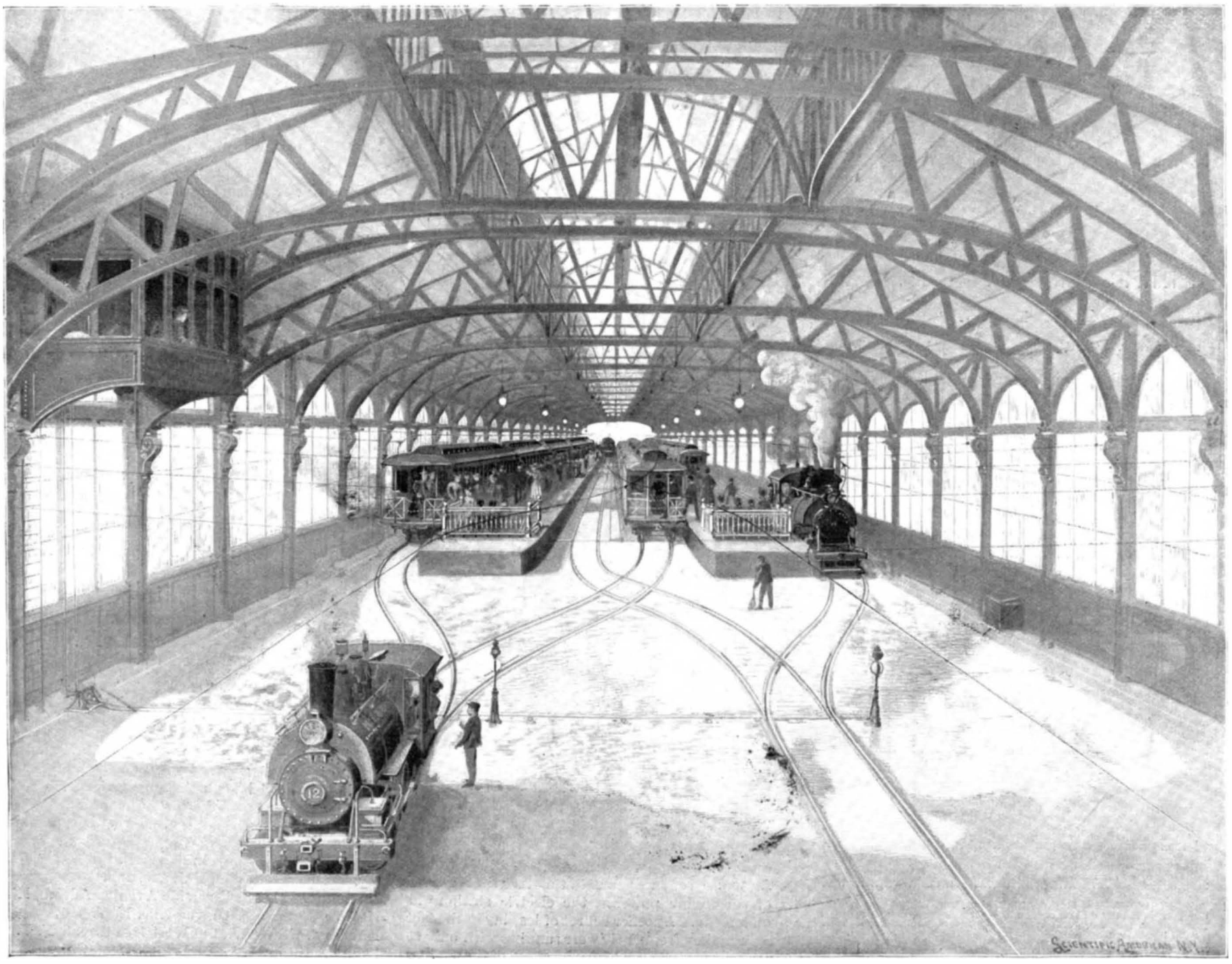
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXIII.—No. 16. ESTABLISHED 1845.] NEW YORK, OCTOBER 19, 1895 [$3.00 A YEAR. WEEKLY.



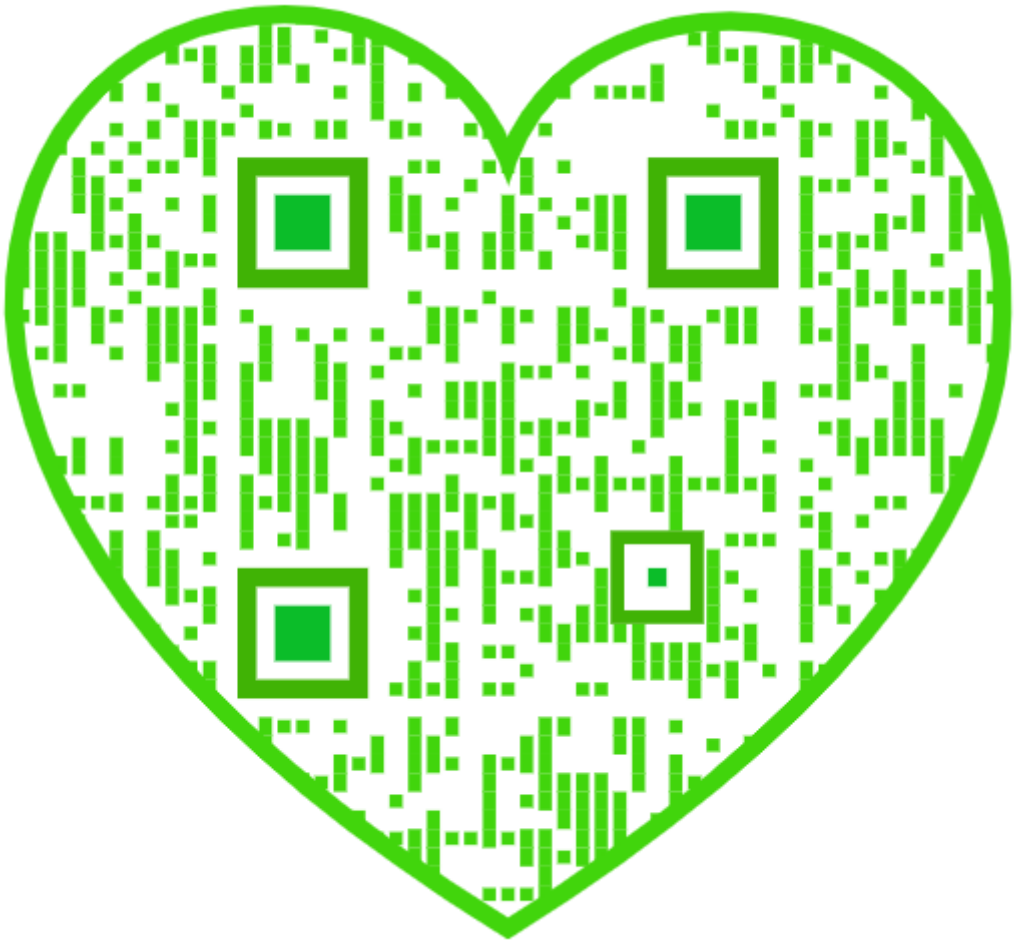
PRESENT APPEARANCE OF THE NEW YORK TERMINAL.

EASTERN END OF BROOKLYN STATION, SHOWING THE BROOKLYN ELEVATED RAILWAY STATION.



NEW YORK AND BROOKLYN BRIDGE—INTERIOR OF THE NEW YORK TERMINAL STATION AS IT WILL APPEAR.—[See page 246.]

© 1895 SCIENTIFIC AMERICAN, INC.



Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S., Canada or Mexico.....$3 00
One copy, six months, for the U. S., Canada or Mexico..... 1 50
One copy, one year, to any foreign country belonging to Postal Union. 4 00
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for the U. S., Canada or Mexico. $6.00 a year to foreign countries belonging to the Postal Union. Single copies 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to one address in U. S., Canada or Mexico, on receipt of *seven dollars*. To foreign countries within Postal Union *eight dollars and fifty cents a year.*

Building Edition of Scientific American.

THE BUILDING EDITION OF THE SCIENTIFIC AMERICAN is a large and splendid illustrated periodical, issued monthly, containing floor plans and perspective views pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To builders and all who contemplate building this work is invaluable. Has the largest circulation of any architectural publication in the world.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, $2.50 a year. To foreign Postal Union countries, $3.00 a year. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, to one address, $5.00 a year. To foreign Postal Union countries, $6.50 a year. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, $9.00 a year. To foreign Postal Union countries, $11.00 a year.

Export Edition of the Scientific American,

with which is incorporated "LA AMERICA CIENTIFICA E INDUSTRIAL," or Spanish edition of the SCIENTIFIC AMERICAN published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number contains about 50 pages, profusely illustrated. It is the finest scientific, industrial export paper published. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. THE SCIENTIFIC AMERICAN EXPORT EDITION has a large guaranteed circulation in all commercial places throughout the world. $3.00 a year, post paid to any part of the world. Single copies 25 cents.

☞ Manufacturers and others who desire to secure foreign trade, may have large and handsomely displayed announcements published in this edition at a very moderate cost. MUNN & CO., Publishers,
361 Broadway, New York.

☞ The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO.

☞ Readers are specially requested to notify the publishers in case of any failure, delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, OCTOBER 19, 1895.

Contents.

(Illustrated articles are marked with an asterisk.)

Bicycle lubrication (6635)..... 253
Bicycle notes 247
Books and publications, new..... 253
Bridge, Brooklyn, station*..... 241
Business hints..... 246
Dream worth millions..... 246
English, teaching 250
Etching on skates (6637)..... 253
Exhibition, Paris, of 1900..... 242
Exposition, the Cotton States... 247
Eyesight, care of the..... 246
Factory, large, moving a..... 246
Filter, the Carter pressure*..... 245
Fish, sucking, the..... 245
Flowers, altering colors of..... 250
Flying machine, a new*..... 249
Galton, Sir Douglas*..... 250
Gilded fabrics..... 243
Gold production..... 245
Goodyear, how he became an inventor..... 252
Grecian remains, ancient..... 248
Hats, felt, stiffening (6638)..... 253
Horseless carriages in France.... 250
Hydraulic power supply..... 242
Inventions, recently patented... 252
Lighting by luminescence..... 243
Lightning, calculated power of.. 243
Luminescence..... 249
Motocycle contest, Chicago Times-Herald 242
Malpractice, medico-legal points 243
Mosquitoes overcome man..... 245
Notes and queries..... 253
Painting iron work..... 250
Patents granted, weekly record. 253
Pipe joint, Sexton's*..... 245
Printing press, a long run*..... 248
Railway speed, fast..... 243
Rubber stamp industry, the..... 247
Sash weight manufacture* 244
Scarf pin lock, Lutters'*..... 246
Science notes..... 247
Sheepskin mat making (6641).... 253
Solar system, size of the..... 251
Spider plant, the..... 245
Tannin plant, a new..... 243
Tempering drills (6634)..... 253
Toads, breeding habits of..... 248
Top, an artistic*..... 248
Turtles, feeding*..... 251
Wages of British workmen..... 246

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 1033.

For the Week Ending October 19, 1895.

Price 10 cents. For sale by all newsdealers.

PAGE

I. ARCHITECTURE.—Church Erected to the Memory of Emperor William.—This fine church was built in four years at an expense of over $700,000.—1 illustration..... 16504
The New York Clearing House.—A description of the new building, which will house one of most powerful financial institutions in America.—2 illustrations..... 16504

II. BOTANY AND HORTICULTURE. The Cultivation of Pampas Grass.—A description of this small but interesting industry in California.—2 illustrations..... 16514
Campanula Vidali.—An interesting bell flower plant found in the Azores.—1 illustration..... 16515
Cherries.—By L. H. BAILEY and G. H. POWELL.—This installment treats of the sour cherries in western New York and the sweet cherry industry..... 16515
A Large Vine.—Details respecting a large black Hamburg grape-vine.—1 illustration..... 16514

III. CHEMISTRY.—A Short List of Books on Chemistry.—Selected and annotated by H. C. BOLTON, Ph.D., author of a "Select Bibliography of Chemistry, 1492-1892."—This useful list of books is now published for the first time and will prove of value in the selection of the best books on the subject.—The list is carefully classified under proper headings..... 16509

IV. FISH CULTURE.—Trout Farms in Bohemia.—A description of trout culture as carried on in Bohemia.—8 illustrations..... 16510

V. MARINE ARCHITECTURE.—A Large Railway Ferry Steamer.—This railway ferry steamer is intended for the Volga.—The steamer is intended to insure unbroken communication even in winter, when the ice is two feet thick.—The river is very swift, so the conditions were very severe.—2 illustrations..... 16505

VI. METEOROLOGY.—Weather Fallacies.—Address delivered to the Royal Meteorological Society by Mr. Richard Inwards, president..... 16512

VII. MISCELLANEOUS.—The Time in China by Sun, Water and Fire.—An interesting description of the various methods of measuring time which are employed in China, including the clepsydra and other instruments..... 16511
Burmese Women.—By H. FIELDING.—An interesting study of the position of women in Burma..... 16516
Herbert Spencer on the Nomenclature of Colors.—An extract from the unpublished autobiography of Mr. Spencer..... 16518
Incubation Among the Egyptians..... 16518

VIII. PHYSICS.—On the Electrolysis of Gases.—The first installment of a paper read at the Royal Society, by J. J. Thomson.—2 illustrations..... 16508

IX. TECHNOLOGY.—The Mother of Pearl Industry.—A description of a curious industry as carried on in West Australia.—5 illustrations..... 16506
Sand Blast Apparatus for Engraving Glass Globes.—A description of a machine for engraving spherical glass globes by the use of sand and water.—1 illustration..... 16507
The Tussah Silk Industry.—Details of the process of manufacture as carried on in India.—5 illustrations..... 16507

X. ZOOLOGY.—The Zoo Heronry.—The heronry is at the Zoological Gardens London.—4 illustrations..... 16511

THE PARIS EXHIBITION OF 1900.

The magnitude of the labor involved in the preparation for a first-class international exhibition may be judged from the fact that already the French people are actively engaged in the preliminary work of organization, although the opening day of their great enterprise is nearly five years distant. It is estimated that the preparation of the grounds, erection of buildings and general maintenance of this exhibition will absorb a round sum of $20,000,000.

How to raise this vast sum is a serious problem, and this is how the directors propose to do it: The Ville de Paris has granted a subvention of $4,000,000. A like sum will probably be obtained in the form of a state subvention, which two sums together will amount to two-fifths of the required amount.

For the remaining $12,000,000 an appeal will be made to the public, and bonds will be offered on some such conditions as attached to the issue of bonds in connection with the Exposition of 1889. In the present instance the exhibition bonds will have a face value of $5, and to each bond will be attached twenty admission coupons.

Each bond, moreover, will entitle the holder to certain lottery privileges, and it will guarantee him a reduction in railroad fare between his place of residence and the Exhibition grounds. This privilege will be graduated according to the distance at which the bond holder may reside from Paris.

From a distance of 200 kilometers from Paris he will be entitled to three special trips; from 200 to 400 kilometers he can claim two such trips; and if he reside more than 400 kilometers away, he will be entitled to one special trip.

To meet the case of those who live in Paris, the bond holder will be given a reduced rate on the admission fee to what are known as the "side shows" and to the theaters and concerts.

It does not seem at first glance as though these incidental and rather questionable benefits would have a very laxative effect on the congested savings of the thrifty Gaul. The response may be slow at first; though it is certain that when it is seen that the success of the Exhibition and the prestige of France is at stake, the French people will respond with that patriotic generosity for which, among the nations of the earth, they stand pre-eminent.

THE ECONOMY OF HYDRAULIC POWER SUPPLY.

In the course of a paper read at the recent summer meeting of the Institution of Mechanical Engineers, at Glasgow, the author, Mr. E. B. Ellington, gave some very significant figures regarding the cost of running the London Hydraulic Power Supply. This is by far the largest municipal supply in the country. It includes 75 miles of mains, carrying a pressure of 750 pounds to the square inch, which deliver 9,500,000 gallons of water at this pressure per week. This serves to operate 2,300 machines. This plant has now been in operation for twelve years, and it yields an annual revenue of $250,000.

In active competition with this scheme is the Westminster Electric Supply Corporation, and a comparative table, drawn up from the records of the running expenses of these two systems, shows a remarkable economy in favor of the hydraulic plant. It appears that the cost of the hydraulic power was 10·34 cents per 1,000 gallons at 750 pounds to the square inch; whereas the cost of an equal amount of electric power measured by the same standard was 18·03 cents per 1,000 gallons.

This economy of the hydraulic system was indorsed by Mr. R. C. Parsons, the engineer who had planned the hydraulic power supply for the drainage of the city of Buenos Ayres; a scheme that cost altogether $30,000,000. The use of electric and of pneumatic power was carefully considered in the preliminary estimates. The electric system was rejected, on the ground that they would have to reduce the speed in order to work the pumps; and, as compact machinery was a necessity, it was seen that in this respect the hydraulic system was greatly superior. It was proved that the compressed air system gave a very low efficiency; and furthermore, owing to the fact that the various lifts, in pumping the drainage, were not of the same height, it was necessary for efficiency that they should have varying pressures. This was not obtainable under the compressed air system. The hydraulic plant, as put in, consists of several small automatic pumping stations supplied from a central station.

As in part explaining the large difference in cost between these two systems of supply, it was suggested that a part of it might be due to the fact that the electric supply station was situated at a distance from the river, and the expense of cartage increased the cost of coal some ten per cent. Another loss of possibly 10 per cent was due to the fact that a large part of the engine power at the electric station was non-condensing. Another source of loss lay in the fact that though they frequently were running with only 55 to 70 per cent of their full load, the speed of the engines was not reduced. At the hydraulic station the speed could be regulated according to the work to be done.

A large part of the difference was due to the difference in "wages and salaries." In the hydraulic installation this item amounted to $43,135 and in the electric to $74,465. This wide difference is probably due to the fact that the electric machinery requires a more skilled class of mechanics than the hydraulic for its operation and maintenance.

After making the above allowances, there yet remains a large amount of leakage that is unexplained.

It should be mentioned that in the table of comparison of these two systems the boiler installations showed a remarkable efficiency, burning only 2 pounds of coal per horse power per hour.

The facts brought out in Mr. Ellington's paper make out an excellent case for hydraulic power supply at high pressures. The installation recently opened in Glasgow, to which we referred in a recent issue, has not been long enough in operation for any accurate estimate of its revenue earning capacity to be made; but the London hydraulic company last year paid the handsome dividend of 6½ per cent.

THE CHICAGO TIMES-HERALD MOTOCYCLE CONTEST.

Less than four months ago the enterprising proprietors of the Chicago Times-Herald newspaper announced that a contest of automobile conveyances, or motocycles, would take place on November 2, and that they would give $5,000 in prizes to the winners of the race.

The only thing which now menaces the success of the contest is the large number of contestants, for though it is expected that a considerable number of those who have entered will fail to put in an appearance on November 2, still the number of contestants will probably be quite large.

The course to be traveled is from Chicago to Waukegan and return. The official route has been announced and comprises almost exactly 100 miles of the best roadway in the West. There are some stretches of ordinary country road, but any practical motocycle will have no trouble in making good time for the entire distance. Signboards will be placed at the intersection of the various roads for the guidance of those who wish to familiarize themselves with the route in advance of the day of the contest. An officer of the contest will be placed at all points where a turn is made, to direct the carriages.

The official list of the contestants who have made entries for the race is as follows:

Arnold, B. J., 1541 Marquette Building, Chicago.
Andrews, A. B., Center Point, Iowa.
Ames, D. J., Owatonna, Minn.
Ames, A. C., 8630 Essex Avenue, South Chicago.
Bradley, Wheeler & Co., Kansas City, Mo.
Bowman, E. Wirt, Evanston, Ill. Mr. Bowman intends to enter four types of vehicles.
Barrows, C. H., Willimantic, Connecticut. Mr. Barrows enters two vehicles.
Barcus, N., 550 East Tawes Street, Columbus, Ohio.
Brown, W. H., Postoffice Box 108, Cleveland, Ohio.
Beck, C. W., 2572 Lakewood Avenue, Chicago.
Chicago Fireproof Covering Co. H. C. Todd, 48 Franklin Street, Chicago.
Chicago Carriage Motor Company. C. O. Hansen, 342 Center Street, Chicago.
Cook & Gowdey, 6324 Madison Avenue, Chicago.
Conklin, Oliver F., Dayton, Ohio.
Carpenter, H. H., 1037 Monadnock Building, Chicago.
Cross, E. D., M.D., 8149 Indiana Avenue, Chicago.
Cronholm & Stenwall. 319 Le Moyne Street, Chicago.
Clapp, Henry W., Sheridan Avenue, Springfield, Mass.
Davis Gasoline Engine Company, Waterloo, Iowa.
Daley, M. H., Charles City, Iowa.
De Freet, Thomas M., Adjutant-General's office, Indianapolis.
Duryea, Charles E., Springfield, Mass., or Peoria, Ill. Mr. Duryea will enter two and possibly three vehicles.
De la Vergne Refrigerating Machine Company. George Richmond. Foot of East 138th Street, New York. This firm enters four machines.
Elrick, George, 904 Irving Street, Joliet.
Elston, R. W., Charlevoix, Mich.
Feerrar, J. C. W., Lock Haven, Pa.
Gawley, T. R., Aurora, Neb.
Guilford, R. W., Auburn, Ind.
Hildebrand, J. A., 308 State Street, Chicago.
Hartley Power Supply Company, 21 Monadnock Building, Chicago.
Hertel, Max, 454 Lincoln Avenue, Chicago.
Hill & Cummings, 232 South Clinton Street, Chicago.
Hall, John W. & Sons, per Harry Lee, Jacksonville, Ill.
Haynes & Apperson—Indiana Natural Gas Company, 23 Buckeye Street, Kokomo, Ind.
Hagaman, J. D., 52 Riverside Avenue, Adrian, Mich.
Holmes, Lyman S., Gloversville, N. Y.
Haviland, Frank W., 210 West 123d Street, N. Y.
Holton, Milton E., 375 Drayton Street, Chicago.
Kappe, W. J. H., Quincy, Ill.
Lewis, George W., 32 Willis Court, Chicago.

© 1895 SCIENTIFIC AMERICAN, INC.

Lasher, R. E., 2732 South Third Street, St. Louis, Mo.
Leppo Brothers, Belleville, Ohio.
Laporte Carriage Company, Laporte, Ind.
Lowery, V. L. D., Eaton, Ill.
M'Donald, P. E., and Brennan, W. F., Kedzie Avenue and Thirty-fifth Street, Chicago.
Macleod, Walter, 137 East Seventy-third Street, New York.
Moelin, J. U., 1810 Fond du Lac Avenue, Milwaukee.
Meredith, Edwin, Batavia, Ill.
Mills, M. B., 125 LaSalle Street, Chicago.
Morris & Salvin, 926 Drexel Building, Philadelphia. This firm enters two electric motocycles.
M'Arthur, A. W., Rockford, Ill.
Mueller, H., Decatur, Ill.
Mills & Searls, Chicago.
Maguire Power Generating Co., the, 709 Masonic Temple, Chicago.
Norton, Fred G., 436 Julian Street, Waukegan, Ill.
Praul, John E., 262 North Broad Street, Philadelphia.
Pierce Engine Company, Racine, Wis.
Parks, W. J. (Ellingen & Parks), La Salle, Ill.
Paterson, William, 302 South Morgan Street, Chicago.
Pierce-Crouch Engine Company, New Brighton, Pa.
Pierce, W. A., Sistersville, W. Va.
Roberts, S. W., 80 Dearborn Street, Chicago.
Riel Import Co. (Benz Motor), 51 Dearborn Street, Chicago. This firm enters two motocycles.
Reid, C. G. (Columbia Perambulator Co.), 98 Market Street, Chicago.
Robertson, G. W., Mount Vernon, Ind.
Radford, W. J., 50 Union Street, Oshkosh, Wis.
Strong & Gibbons, 181 West Madison Street, Chicago.
Smith, Ira D., 6004 Ellsworth Avenue, Pittsburg, Pa.
Stone & Maynard. Avonia, Pa.
Smith, Otis E., Hartford, Conn., box 38.
Shaver, Joseph, Walnut and Nineteenth Streets, Milwaukee.
Sturges Electric Motocycle, 1137 Marquette Building, Chicago.
Schoening, C. J., Oak Park, Ill.
Sintz Gas Engine Co., Grand Rapids, Mich.
Schindler, A. J., 441 West Twenty-first Street, Chicago.
Teepleton, John, 1616 Masonic Temple, Chicago.
Thomas Kane Co., 137 Wabash Avenue, Chicago. This firm enters six motocycles.
Taylor, Elwood E., Fitchburg, Mass.
Vanall, Frank, 1031 Gurney Street, Vincennes, Ind.
Verret, U. J., 313 Cherry Street, Pine Bluff, Ark.
Woolverton, G. C., 327 Washington Street, Buffalo, N. Y.
Wayne Sulkeyette and Road Cart Co., Decatur, Ill.
Wilkins, Vernon H., 2249 Ridge Avenue, Evanston, Ill.

For the benefit of those who have entered in the race and those who have not closely followed the details of this great contest, the original offer made by the Times-Herald is reprinted, with the rules as they will stand until announced more in detail by the judges, who will be named in a short time.

With a desire to promote, encourage, and stimulate the invention, development, perfection and general adoption of motor vehicles or motocycles, the Times-Herald offers the following prizes, amounting to $5,000, divided as stated:

First prize—$2,000 and a gold medal, the same being open to competition to the world.

Second prize—$1,500, with a stipulation that in the event the first prize is awarded to a vehicle of foreign invention or manufacture, this prize shall go to the most successful American competitor.

Third prize—$1,000.

Fourth prize—$500.

The third and fourth prizes are open to all competitors, foreign and American.

It must not be supposed that in this contest the question of speed is the only requisite to be considered. It would be possible for an ingenious mechanic to construct a machine with which he could easily outstrip all others in this contest, and yet that device would be of no utility and the outcome of no value to the world from a practical point of view.

It is the earnest desire of this paper that this contest shall add to the sum of our mechanical knowledge in this, the new branch of the science of transportation. In this spirit the following rules are laid down for the guidance of all who may desire to enter into the competition.

1. The date of the contest will be on Saturday, November 2, 1895. The judges may postpone the contest if in their judgment the state of the weather or the condition of the roads will not permit a fair trial.

COURSE OF THE CONTEST.

2. The contestants will start at the junction of Midway Plaisance and Jackson Park, and at the signal from the judges will take up the following course: West on Midway Plaisance to Washington Park; northwest through Washington Park past the refectory to Garfield boulevard or Fifty-fifth street; west on Garfield boulevard to Western avenue, which is also a boulevard; north on Western avenue boulevard to Thirty-fourth street, at which point the boulevard is left and a short turn is made to the west, and the route continues north on Western avenue proper to Twenty-sixth street, thence west to the boulevard; north and west on the boulevard to California avenue; north on California avenue to Ogden avenue and Douglas Park; northwest through Douglas Park to the Fourteenth street boulevard, which turns and leads north to Garfield Park; through Garfield and Humboldt Parks by the connecting boulevards to the intersection of Humboldt boulevard and Milwaukee avenue; northwest on Milwaukee avenue to Jefferson Park, and thence northwest and north on the Chicago and Milwaukee gravel road, which is a continuation of Milwaukee avenue, through Niles, Wheeling, Half Day and Libertyville to Gurnee, where the route turns directly east on Grand avenue to Waukegan. From Waukegan the route proceeds south on an easily followed road through South Waukegan, Lake Bluff, Lake Forest, Fort Sheridan, Highland Park, Ravinia, Glencoe, Winnetka and Wilmette to Evanston. From Evanston south on Chicago avenue to Grand avenue; east on Grand avenue to Kenmore avenue; south on Kenmore avenue to Lawrence avenue; east on Lawrence avenue to the Sheridan road; south on the Sheridan road to Grace street; east on Grace street to Pine Grove avenue; south on Pine Grove avenue to Cornelia street; east on Cornelia to the Lake Shore boulevard, and thence south to Lincoln Park, and along the Lake Shore drive to the Grant monument, where the finish will be made.

STYLE OF VEHICLES ALLOWED TO ENTER.

3. The contest is limited to motocycles, or, as they are more commonly known, "horseless carriages." There will be eligible to competition any and all vehicles having three or more running wheels, and which derive all their motive power from within themselves. No vehicle shall be admitted to competition which depends in any way upon muscular exertion, except for purposes of guidance. Competing vehicles which derive their power from petroleum, gasolene, electricity or steam, and which are provided with receptacles for storing or holding the same, will be permitted to replenish their motive power at Jefferson Park, Half Day, Waukegan and Winnetka, and at no other points. Each contestant must make his own arrangements for taking advantage of these relay points.

4. No vehicle shall be admitted to competition unless it shall comfortably carry not less than two persons for the entire distance, one of whom may have charge of the vehicle and the manipulation of the same.

5. No vehicle shall be admitted to competition except that it be free from danger, not only to its occupants but to spectators and the public users of the highway. The judges at their discretion may debar any vehicle which from its construction gives evidence of defects which would render the adoption of its type an evident impossibility.

6. For the purpose of limiting the contest to vehicles of practical utility a preliminary test of all vehicles entered for competition shall be held by the judges on October 29, 30 and 31, under such rules as the judges may determine on, and for such a distance as they may decide. At this test the judges may debar such constructions as in their opinion do not possess features entitling them to further consideration. It is stipulated, however, that all motor vehicles which won prizes or honorable mention in the Paris-Rouen contest in 1894, or in the recent race between Paris and Bordeaux, shall not be compelled to compete in the preliminary test, but shall be admitted upon proper application to the final competition on November 2.

7. In making awards the judges will carefully consider the various points of excellence as displayed by the respective vehicles, and so far as possible select as prize winners those constructions which combine in the highest degree the following features and requisites, rating them of value in the order named:

A. General utility, ease of control and adaptability to the various forms of work which may be demanded of a vehicle motor. In other words, the construction which is in every way the most practical.

B. Speed.

C. Cost, which includes the original expense of the motor and its connecting mechanism and the probable annual item of repairs.

D. Economy of operation, in which shall be taken into consideration the average cost per mile of the power required at the various speeds which may be developed.

E. General appearance and excellence of design. While it is desired that competing vehicles present as neat and elegant an appearance as possible, it should be assumed that any skilled carriage maker can surround a practical motor with a beautiful and even luxurious frame.

The date of the contest will not be changed from Saturday, November 2, except for extremely bad weather or condition of the roads. In answer to many inquiries as to how the carriages will be started, it may be assumed that the judges will start them one or two at a time, keeping accurate record of the exact time each carriage passes the starting point, the same as is the rule in a yacht race. The various vehicles will be designated by numbers, conspicuously displayed, and a record will be kept of the time at which they pass various points along the road.

Some Medico-Legal Points in Regard to Malpractice.

The following points with regard to a physician's liability in suits for malpractice are given in the General Practitioner:

1. A physician is guilty of criminal malpractice when serious injury results on account of his gross ignorance or gross neglect.

2. A physician is guilty of criminal malpractice when he administers drugs, or employs any surgical procedure, in the attempt to commit any crime forbidden by statute.

3. A physician is guilty of criminal malpractice when he willfully or intentionally employs any medical or surgical procedure calculated to endanger the life or health of his patient, or when he willfully or intentionally neglects to adopt such medical or surgical means as may be necessary to insure the safety of his patient.

4. A physician is civilly responsible for any injury that may result to a patient under his care, directly traceable to his ignorance or his negligence.

5. A physician is expected by the law to exhibit in the treatment of all his cases an average amount of skill and care for the locality in which he resides and practices, further than this he is not responsible for results, in the absence of an express contract to cure.

6. A physician is not relieved of his responsibility to render skillful and proper treatment or reasonable care and attention by the fact that his services are gratuitous.

7. A physician is not obliged to undertake the treatment of any case against his will, but having once taken charge, he cannot withdraw without sufficient notice to allow his patient to procure other medical assistance.

8. A physician having brought suit and obtained judgment for services rendered, no action for malpractice can be thereafter brought against him on account of said services.

9. A physician is relieved of all responsibility for bad results in connection with the treatment of a case when there can be proved contributory negligence on the part of the patient.

199 Miles in 175 Minutes.

The record-breaking train on the Lackawanna road, which left East Buffalo at 8:47 A. M., arrived in Corning, 130 miles distant, at 10:49, October 5. From Corning to Big Flats, a distance of 6½ miles, the run was in exactly 4 minutes, or at the rate of 99½ miles per hour. The distance from Corning to Elmira, 16 miles, was made in 11 minutes. The 199 miles from Buffalo to Binghamton were covered in 175 minutes. This train, which consisted only of the engine, a hotel car and a common coach, arrived in Hoboken at 4:19 o'clock, October 5, making the run of 407 miles from East Buffalo in 452 minutes, including all stops and slow-ups.

The only passengers were Joseph Walker, the Wall Street broker, who is a son-in-law of Sam Sloan, president of the D., L. & W., and the members of Mr. Walker's family. The distance between Elmira and Binghamton, 57 miles, was made in 54 minutes. The run of 67 miles between Washington, N. J., and Hoboken was made in 66 minutes.

This is considered remarkable speed, on account of the bad grades, the numerous drawbridges, and the many railroads which the Lackawanna road crosses. The train stopped at Elmira, Binghamton, Scranton and Washington, N. J. At each of these places the engine was changed.

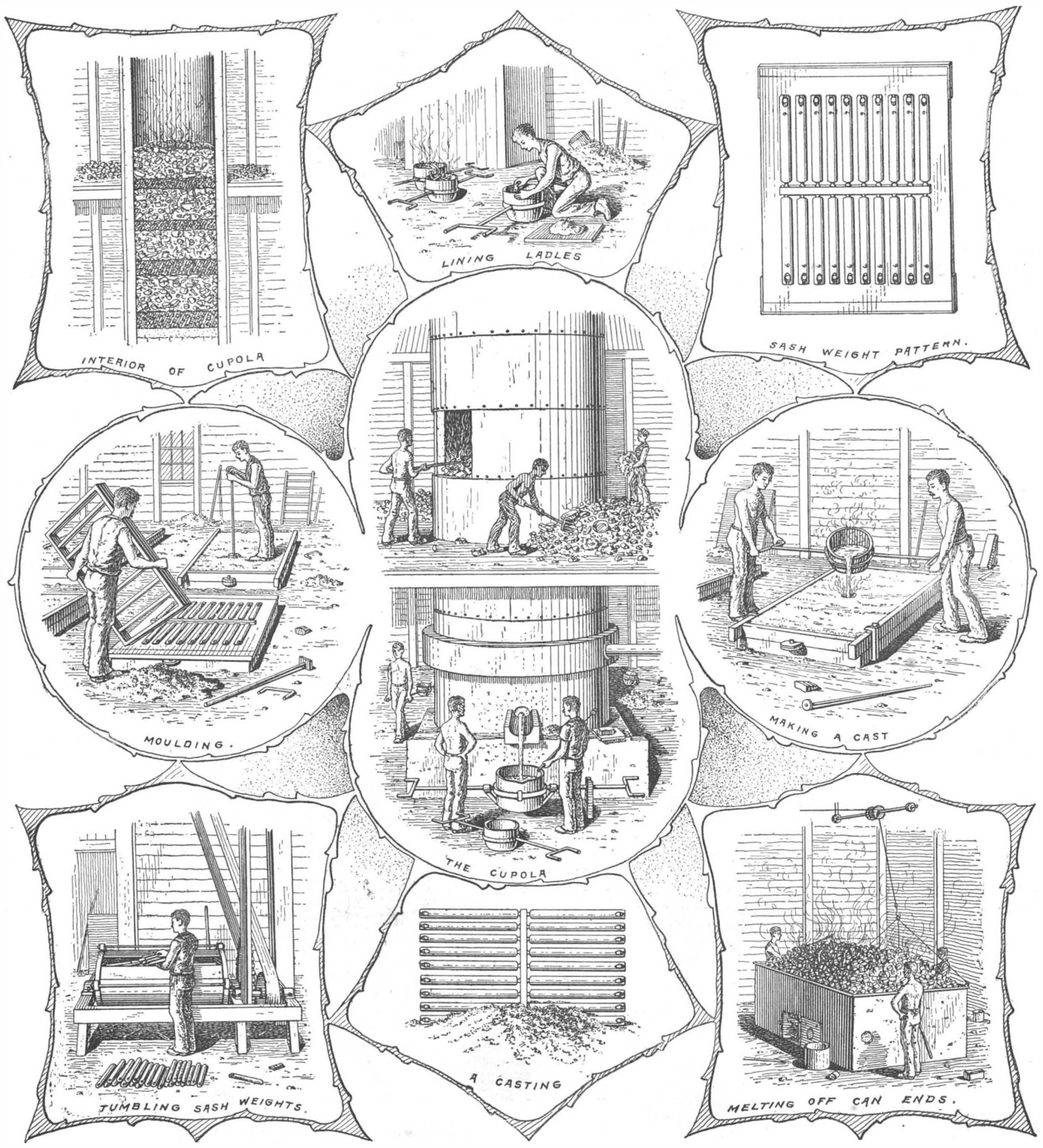
Calculated Power of Lightning.

It is no doubt interesting to express the force of a stroke of lightning in horse power. During a recent storm which passed over Klausthal, Germany, a bolt struck a wooden column in a dwelling and in the top of this column were two wire nails $\frac{5}{32}$ inch diameter. The electric fluid melted the two nails instantly. To melt iron in this short time would be impossible in the largest furnace now in existence and it could only be accomplished with the aid of electricity, but a current of 200 amperes and a potential of 20,000 volts would be necessary. This electric force for one second represents 5,000 horse power, but as the lightning accomplished the melting in considerably less time, say $\frac{1}{10}$ of a second, it follows that the bolt was of 50,000 horse power.—Dr. C. Grottewitz, Barmer Zeitung.

© 1895 SCIENTIFIC AMERICAN, INC.

MANUFACTURE OF SASH WEIGHTS FROM OLD TIN CANS.

A great number of the sash weights used for windows, dumb waiters, etc., are made from old tin cans and scrap tin. The cans are gathered up by the weight manufacturers from the public dumps at very little expense. New scrap tin from stamping manufactories costs $2 to $4 per ton. The tin cans before melting have the solder extracted by heating them over a brick furnace. The cans are placed on a screen made of heavy wire, which rests on top of the oven. A quantity of crude oil, enough to wet them thoroughly, is thrown on them, and the oil set on fire, the heat of which melts off the tops and bottoms of the cans. The solder drops down on a pan below the screen and runs off into a receptacle to be moulded into bars of moulding sand, which prevents the molten metal from burning out the iron bottom. In starting the fire in the cupola, about one ton of hard coal is used, on which, thrown in from above, is about 6 feet of tin material. A layer of hard Pittsburg coke is then placed on top of the tin to the depth of about a foot, and then another layer of tin, the same operation being repeated until the cupola is filled to the door above. From 400 to 500 lb. of black or petroleum coke is thrown in occasionally to keep up the required heat. Steel forks are used for handling the tin material, it requiring the constant labor of three or four men to keep up the supply in the cupola. The black coke used is made of a mixture of soft coal dust and waste petroleum, the two ingredients being baked in ovens and broken up into small chunks. The sash weight patterns are made of white pine, one-half of the weight pattern being nailed directly opposite the other on each side of what is called a cardboard. On each board from two to three sets of patterns are placed in rows about ¾ of an inch apart, a strip of wood or gate to which the ends of the weights are fastened separating the sets from each other. The weights when cast range from 13 to 30 inches in length, and from 1¼ to 2¼ inches in diameter, and weigh from 5 to 30 lb. each. A mould is formed by placing the pattern board, which has been sprinkled with parting sand, between an upper and lower flask, the moulding sand being packed or pressed first in one flask and then the other. After the flasks have been properly filled with sand and leveled off, a gate running into the mould below is formed in the top flask. By lifting off the top flask the cardboard or pattern is removed, leaving the impression of the weight in the sand. The upper flask is then replaced and the two flasks clamped securely together ready for the cast. The pattern board is about 4 feet in length, about 2½ feet in width, and about 1 inch in thickness. From 12 to 36 weights are cast in each mould, the quantity of metal required weighing from 150 to 200 lb. The ladles used for carrying the molten metal to the moulds have to be lined with sand and burned. This is performed by covering the interior of ladle with wet sand to the depth of an inch, and baking it hard by means of a wood fire for about one hour, the object of lining being to prevent the hot metal from burning through the ladle. When the moulds are all ready, the molten material is run out of the mouth of



MANUFACTURE OF SASH WEIGHTS FROM OLD TIN CANS.

again for the market. As soon as the bottoms of the cans are loose, the attendants beat them with clubs, causing the parts to separate. They are then dumped out on the floor by means of a pulley which lifts up one side of the screen, and then taken to the cupola to be melted. The cupola, in which the cans are melted, is about 75 feet in height and about 6 feet in diameter, and made of 4 foot sections of boiler iron, the interior lined with 8 inches of fire brick. The cupola stands on four iron pillars which rest on a concrete foundation. The air blast passes up through the bottom of the cupola by means of a blower, the air first passing through a 12 inch pipe and into a wind box about 19 inches in height and 10 inches in width, which encircles the lower part of the cupola. From the wind box the air passes into the furnace by means of 19 tuyere holes 4 × 4 inches square. The bottom of the cupola on the interior is coated with about a foot the cupola through a two inch hole into a large ladle holding about 1,500 lb., from which the small ladles are filled. Each small ladle holds about 200 lb. of the hot material, which is taken away as soon as it is filled by two hands and poured into a mould, the operation taking about one minute. After cooling, the castings are turned up on end, and each weight tapped off the gate, which holds them together, with a hammer. They are then placed within an iron tumbler or cylinder about 5 feet in length and about 3 feet in diameter, for about one-half to three-quarters of an hour. About 2 tons of the weights are placed in the tumbler at a time, the revolving of which, at the rate of 60 revolutions per minute, rubs off the sand and smooths the rough edges. About 1,600 lb. of iron is secured out of every ton of tin. The sketches were taken from the plant of the United States Foundry Company, Jersey City, N. J.

© 1895 SCIENTIFIC AMERICAN, INC.

The Remora or Sucking Fish.

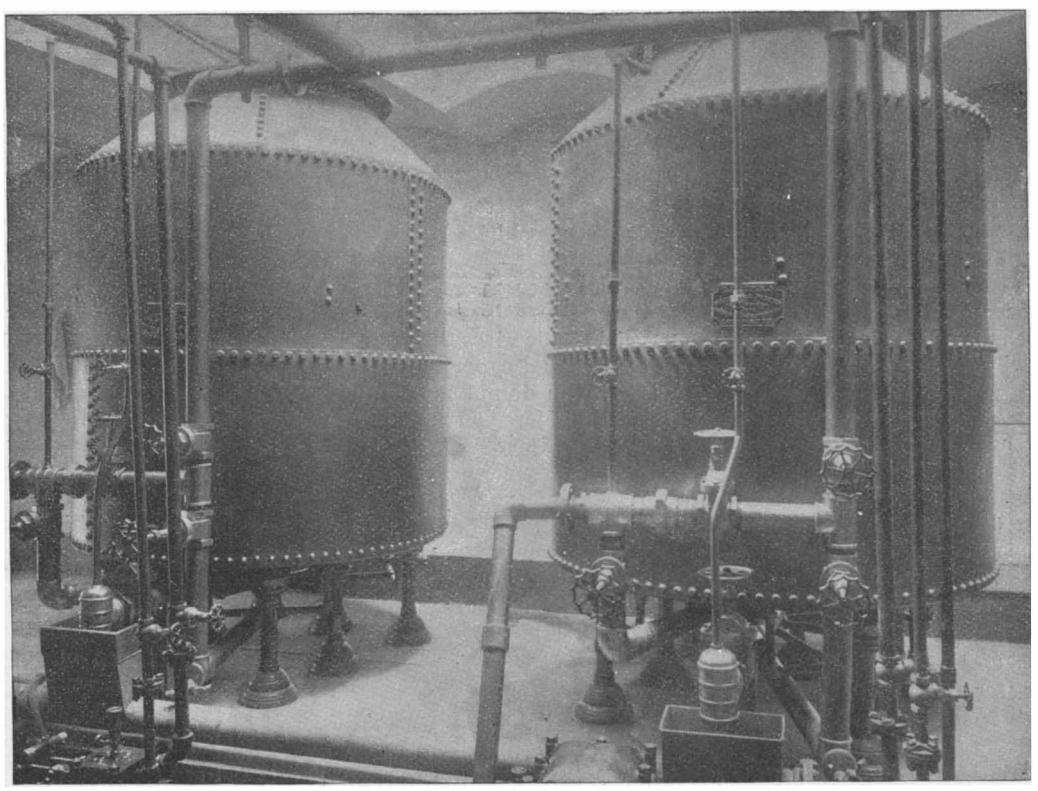
A striped remora, or sucking fish, was found recently attached to the bottom of one of the steam launches which run around Glen Island, says the New York Sun. It was transferred to one of the large tanks of the Glen Island aquarium. The fish, though not rare, is a deep sea fish, and is hard to capture. It grows to the length of twelve to eighteen inches. The flat top of its head is surmounted by a large sucking disk extending from near the tip of the upper jaw to the ends of the pectoral fins, or about one-third of the total length of the fish. The disk is made up of seventeen or eighteen pairs of bony laminæ, the edges of which are furnished with rows of minute tooth-like projections. With this disk the fish attaches itself to a shark, a turtle, or some other larger fish, and is in this manner drawn through the water without the exertion of swimming. Occasionally it will release its hold long enough to swim off and get something to eat, but immediately returns to refasten itself.

The South American Indians make use of this instinct of the fish to catch sea turtles. They fasten a ring around the remora's tail to which they attach a long line. The fish is then taken to sea, and when a large turtle is sighted the remora is thrown overboard. It unerringly swims to the turtle and makes fast. The line is then drawn in, and soon both turtle and remora are in the boat. It is necessary, however, to wait until the fish feels inclined to let go, for it is impossible to detach it from the object by force without injury.

THE CARTER PRESSURE WATER FILTER.

This filter, patented in 1890, represents many years' labor and experience of its inventor, Mr. James Carter, and its successful introduction, within the past five years, in so many places where large quantities of filtered water are needed, affords the best possible attestation of its merit. Our illustration represents two of these filters built especially for the new aquarium at Castle Garden, New York, and said to be the only Tobin bronze filters in the world. They are non-corrosive by the action of salt sea water, and have a daily capacity of one hundred thousand gallons each. Two other Carter pressure filters, made of sheet steel, and having a daily capacity of fifty-five thousand gallons each, are used for purifying the fresh water in the aquarium and throughout the building.

These filters are built by the Field Force Pump Company, of Lockport, N. Y. The filter comprises a smaller inner and a large outer cylinder, the latter being nearly filled with a good filtering sand, and the water is taken in at the bottom and forced upward through the central cylinder, at the top of which it passes in a thin sheet over into the top of the larger surrounding cylinder, where it is evenly distributed over the filtering material without channeling and without diminishing the pressure. In the top of the filter is a chamber in which is held a coagulant, such as alum crystals, and at the bottom of the chamber, immediately over the central cylinder, is a corrugated cup adapted to deliver a small amount of the coagulant, or a larger amount may be delivered when the water is quite roily, the effect being to precipitate the impurities, so that they will be effectually arrested by the filtering materials. The water, after passing down under pressure through the filtering bed, issues through strainers into a delivery pipe, clear and sparkling, and freed from all impurities. To clean the filter, which should be done about once every twenty-four hours when water is being constantly passed through, is but a matter of a few minutes, and requires only the shutting off of two cocks and the opening of two other cocks. By this means the flow is reversed, and all the impurities that have been arrested by the filter bed are carried backward through the central cylinder and discharged into a sewer or waste pipe. The filter may be located in the basement or cellar, and connected with the street water mains, when all the water passing through the house will be automatically purified. These filters are particularly adapted for use in hotels, laundries and large buildings.

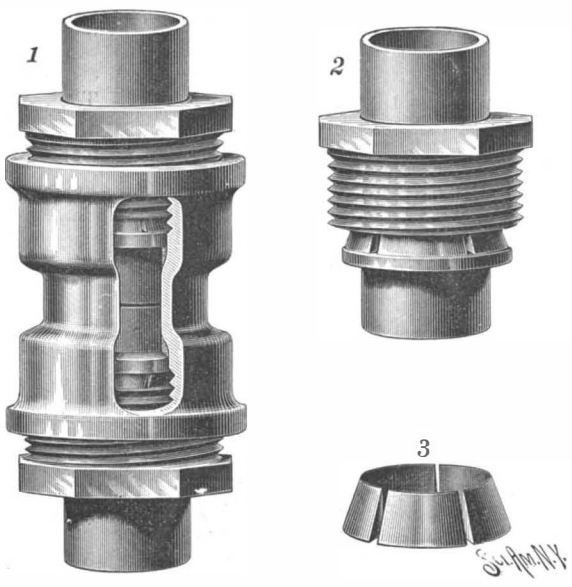


TOBIN BRONZE SALT WATER FILTERS OF THE CASTLE GARDEN AQUARIUM.

IT has been ascertained that ammonia in the air is the main cause of flowers losing their tints and colors In order to preserve them in their natural state, as nearly as possible, they should be preserved between paper that has been previously saturated in water having one per cent of oxalic acid.

AN IMPROVED PIPE JOINT.

The illustration represents improved means of uniting pipes without threads cut on their ends, and without solder, calking or flanges. The improvement has been patented by Michael Sexton, of No. 1112 Third Avenue, New York City. As shown in Fig. 1, a sleeve, whose central portion is cut out to show its application, is placed over the abutting pipe ends, and into the internally threaded ends of the sleeve screw the



SEXTON'S PIPE JOINT.

exterior threads of collars fitting over the end of each pipe, as shown in Fig. 2. These collars are beveled at their inner edges, and engage beveled split rings, as shown in Fig. 3, the base or inner ends of the rings abutting on washers resting against packing rings seated on the beveled sides of an annular depression near the middle of the sleeve. When the collars are screwed up in the ends of the sleeve, their inner beveled ends move the rings inward against the washers and at the same time compress and fasten the rings upon the pipe surfaces, forming a friction joint, and providing a very good fluid-tight connection inside the coupling.

Mosquitoes that Overcome Man.

Gold in plenty may be found in the sands of the Volador River—a stream of moderate volume that falls from the snow line of the Sierra de St. Martha in South America; but though the lowland region and the river bed where the precious metal abounds in fabulous quantities are easily accessible, the mosquitoes are so thick and terrible there that all attempts to rifle the sands of their gold have so far failed. Elisée Reclus, the celebrated French geographer, was the first to explore the plain about the Volador's mouth. He had thought of establishing an agricultural colony in the fertile lowlands, but found the plague of insects so unbearable that he was forced to beat a retreat and abandon his project. He was the discoverer of this wonderful stream, whose waters sweep over sands which are literally golden. He told the news to the French vice-consul at Rio Hacha, and this official obtained the concession of this Eldorado. The dangers he was to encounter he knew perfectly well. He took with him when he set out an ingeniously constructed gauze tent of large dimensions. For two days he tried to live under its shelter and watch the operations of his workmen, who toiled in the stifling heat, clothed in thick garments, and protected by heavy boots, gloves and veils. At the end of the second day both employer and employes gave up the struggle and retreated. The next who tried to wring fortune from these auriferous sands was an Italian, who obtained permission from the vice-consul. The Italian laughed at the idea of mosquitoes driving any one away from a place where gold could be picked up almost by the handful. He started out with a party of six who shared with him his belief, and so they took along no special protection against the insects. They endured for less than half an hour the awful torture, and then left. They found their way back to Rio Hacha with difficulty, for the eyes of five were so badly swollen that they were blind. Yet there are human beings who can venture with impunity into this gold mine whose guardian demons are mosquitoes, and these are some of the savage natives of the mountains from whose rocky steeps the river falls. These savages, who are mosquito proof, are rendered so by their bodies being covered with the scales of leprosy. Strange to say, the mosquitoes will not touch them. But neither gold nor the fascination of civilization will tempt them to labor. It is an old and true saying that one might as well try to get along without furs in the Arctic regions as without mosquito nets in the tropics.

Gold Production.

The summing up of 1894 showed a total production in round figures of $180,000,000, an increase of $23,000,000 over 1893. This yield was about $30,000,000 greater than the product of any year when the placer mines of California and Australia were at their maximum. The indications now point to a yield of $200,000,000 for the calendar year 1895, another increase of $20,000,000, and an increase of $43,000,000 in the annual output in two years, and of $54,000,000 in three years. As the anuual supply of gold is not used in the year, but is mostly added to the pre-existing sum, it follows that the world's stock has been increased in the three years named by the enormous sum of $537,000,000.

The consumption of gold in the arts is undoubtedly increasing generally, although there was a marked diminution of such use in the year 1894, owing to the hard times. The use of gold for purposes of adornment, which is almost its only use except as money, rises and falls according to the prosperity of the nations. It is an article of luxury. These uses in the United States, according to the calculations of the mint, were about $19,000,000 in 1893, but fell to $13,500,000 in 1894. Very likely the consumption of the present year will equal or exceed that of 1893. On the other hand, the product of the gold mines of the United States, according to the estimate for 1895, will be $46,000,000, against $39,500,000 in 1894. The South African product is estimated at the same figure as that of the United States, $46,000,000; that of Australia at $43,000,000, and that of Russia at $29,000,000. These four countries produced three-fourths of the world's annual yield.

The Spider Plant.

Travelers who visited or passed the Cape Negro country of Africa often heard from the natives of a plant that was part spider, and that threw its legs about in continual struggles to escape. It was the good fortune of Dr. Welwitsch to discover the origin of the legend. Strolling along through a wind swept tableland country, he came upon a plant that rested low upon the ground, but had two enormous leaves that blew and twisted about in the wind like serpents; in fact it looked, as the natives had said, like a gigantic spider. Its stem was 4 feet across and but a foot high. It had but two leaves in reality, that were 6 feet or 8 feet long, and split up by the wind so that they resembled ribbons. This is probably the most extraordinary tree known. It grows for nearly if not quite a century, but never upward beyond about a foot, simply slowly expanding until it reaches the diameter given, looking in its adult state like a singular stool on the plain, from 10 feet to 18 feet in circumference.

When the wind came rushing in from the sea, lifting the curious ribbon like leaves, and tossing them about, it almost seemed to the discoverer that the strange plant had suddenly become imbued with life and was struggling to escape.

© 1895 SCIENTIFIC AMERICAN, INC.

THE NEW TERMINALS OF THE BROOKLYN BRIDGE.

Nothing shows more impressively the rapid growth of the metropolis than the continual and imperative demands for means of transportation for the hundreds of thousands of people whose business is located in New York and whose homes are in the adjacent towns. Brooklyn is the greatest of these cities of residence, and, although means have been multiplied for transporting the people, still the demand for greater facilities increases.

Since the opening of the Bridge Railway on September 24, 1883, the railway has had a carrying capacity of over 200,000 passengers per day, the largest number for one day being 223,625, which was October 12, 1892. Since the opening of the railway there have been numerous alterations and improvements to facilitate the handling of passengers to the fullest extent under the existing system. In ten years the facilities proved totally inadequate, and greater capacity being imperatively demanded, the present new system of operation was devised and the construction of the terminal stations, which are now partly finished, was begun.

The Brooklyn station, although still incomplete, is farther advanced than that at the New York end.

We give an engraving of the interior of the New York terminal station as it will be when finished, the view being taken from the City Hall or western end of the building. The structures at the opposite ends of the bridge are practically alike, except that the Brooklyn station is constructed to accommodate elevated railroads at either end and at the side and is provided with galleries to permit of passing over the cars and tracks, giving access to the passages which lead to the elevated railroad platforms. The bridge station of the Brooklyn Elevated Railroad is integral with the bridge station, and is built by the bridge and leased by the elevated railroad. The Kings County Elevated Railroad is provided with structures of its own outside of the bridge station.

The system of tracks, by means of which the capacity of the bridge railway is to be practically doubled, is illustrated in the view of the New York station. The tracks on opposite sides of the bridge are double, each being composed of two pairs of rails, one pair of rails on one side of the bridge leading to the right of one platform, the other pair of rails leading to the right of the other platform. The rails of the track on the other side of the bridge are arranged in a similar way, one pair leading to the left of one platform, the other leading to the left of the other platform. Arranged in this way, each train comes in on a track which is contiguous to the platform, there being no switching.

It will thus be seen that the movements of the train are positive and that there can be no mishap due to misplaced switches. The only switches used are those employed for shifting the empty trains from the incoming tracks to the outgoing tracks. These switches are to be operated by a man in the elevated gallery shown in the left of the illustration. At present steam locomotives are employed in the switching, but an experiment looking to the application of electric locomotives for this purpose is soon to be tried, it being desirous to abolish the smoke and noise of the steam. At present the trains are operated under a headway of one and a half minutes; under the new system the headway is to be cut down to forty-five seconds. It has been observed that the platform is cleared of passengers in thirty seconds on an average, and it is believed that when the new system is in complete working order, with the number of trains doubled, the congestion at the stations will be completely obviated and the capacity of the stations will be ample for many years to come.

The City Hall station at the New York end will cover the site of the old station and extend beyond it, the railway having been changed already so far as possible, to adapt it to the new system. This station is rectangular, 521 feet long and 87 feet 6 inches wide. There will be two floors. On the upper floor will be the tracks and two elevated platforms, as shown in the illustration, and there will be an intermediate floor on which will be located the toilet rooms and the ticket sellers' boxes. There will be six stairways from the first floor to the platforms, and communication with Rose and William Streets by means of stairways and elevators.

The Brooklyn terminal station, which is already well along toward completion, is 357 feet in length and 90 feet wide. The arrangement of platforms and stairways is substantially the same as that of the New York station.

In the construction of the Brooklyn station 420,000 pounds of cast iron have been used and 3,400,000 pounds of steel. The work of erecting these structures at the ends of the bridge has been carried on without serious interruption of traffic, the old buildings having been torn down and the new ones built up while the thousands of passengers have surged back and forth as usual.

THE highest chimney in the world is at Glasgow. Height, 474 feet.

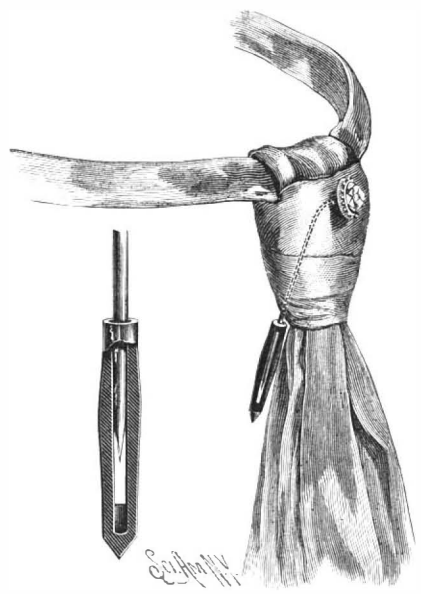
His Dream Was Worth Millions.

Elias Howe almost beggared himself before he discovered where the eye of the needle of a sewing machine should be located. His original idea was to follow the model of the eye at the heel. It never occurred to him that it should be placed near the point, and he might have failed altogether if he had not dreamed he was building a sewing machine for a savage king in a strange country. Just as in his actual working experience, he was rather perplexed about the needle's eye. He thought the king gave him twenty-four hours to complete a machine and make it sew. If not finished in that time, death was to be the punishment. Howe worked and worked and puzzled and puzzled, and finally gave it up. Then he thought he was taken out to be executed. He noticed that the warriors carried spears that were pierced near the head. Instantly came a solution of the difficulty, and while the inventor was begging for time he awoke. It was four o'clock in the morning. He jumped out of bed, ran to his workshop, and by nine o'clock a needle with an eye at the point had been rudely modeled.

[The Philadelphia Times, we believe, is responsible for the above story. It is so well told we give it place, but we have doubts about the eye-pointed needle being invented in just the way the article states it to have been.—ED.]

A SCARF PIN LOCKING DEVICE.

To securely lock a scarf pin in place, preventing its being lost or stolen, the device shown in the accompanying illustration has been devised and patented by Robert E. Lutters, Tenth Street, between Fourth and Fifth Avenues, College Point, L. I., N. Y. It consists of a sleeve adapted to engage and form a spring clamp upon the shank of the pin near its point, after the pin has been inserted in the scarf, as shown in the larger view. The sleeve, as better shown in the small view, is longitudinally slotted, and the insertion therein of



LUTTERS' SCARF PIN LOCKING DEVICE.

the shank of the pin spreads the body of the sleeve, and causes it to take a sufficiently firm frictional hold upon the pin to secure the latter from removal or displacement. The safety locking device is preferably made of hard rubber.

Three Good Business Hints.

Lloyds Commercial Guide gives the following advice to its readers. Never sign a paper without reading it; and if, after reading, you do not understand it, have it thoroughly explained before you put a signature to it. It is best to get some third person, who is not interested in the matter at all, to explain the meaning of what is not clear, or to point out words that may have two meanings in the document.

Always make a memorandum in your little book of any contract you undertake for money or any agreement to work. It saves much trouble to keep a memorandum book and put down the dates when you either pay or receive money. Whenever money passes on account, set it down. If any money or thing of value goes through your hands, give a receipt for it and make a memorandum. Your receipt settles the amount that passes, and that cannot be disputed. When you pass it to a third party, get a receipt and keep it. This form is as important in the transfer of income, trust money, or valuables among your own family as with other persons.

Never allow a person to do any service for you without first agreeing upon the cost to you. This rule, strictly adhered to, will save you many annoyances.

That Mammoth Potato.

The photo. picture of the mammoth potato we published on page 199 proves to be a gross fraud, being a contrivance of the photographer who imposed upon us as well as others. An artist who lends himself to such methods of deception may be ranked as a thoroughbred knave, to be shunned by everybody.

Average Wages of British Workmen.

There has been issued from the Board of Trade an elaborate report dealing with the average wages paid in several trades throughout the United Kingdom. The report has been prepared by Sir Richard Giffen, and accuracy is thus abundantly established. It is, says Engineering, a monument of great labor, for there are 500 closely printed pages of figures.

The average wage, according to the returns made, is 24s. 7d. per week, equal to £64 (or $320) per annum, quite a satisfactory figure, especially when it is remembered that the summation includes several industries which are not highly skilled, and includes also in all trades the helpers and laborers engaged in each. The average wage for women is 12s. 8d., which again is satisfactory, for many dressmakers, milliners, etc., are included, who only receive a nominal wage while learning their art. Lads and boys get 9s. 2d., and girls, where also the "improver" tends to reduce the average result, 6s. 5d. These average results are arrived at by an analysis of returns of wages actually paid for 1885, and of the wage paid for a stipulated day or week in 1886, with the maxima and minima paid in one week. Nearly a million workers were brought under this census, after all doubtful cases had been eliminated. As the trades were representative of all classes and districts, the return may not err on the side of the maximum. As reflecting on the minimum wage question again, the fact that only 2·5 per cent of men are paid less than 15s. is significant, while only one-fourth of all men workers have less than £1 a week. One-third of the men engaged have 20s. to 25s.; and 24·2 per cent between 25s. and 30s. This is what one would expect—that 58 per cent of workmen come within the class of 20s. to 30s. a week—limits which certainly afford a fair competency. Between 30s. and 35s. there are 11·6 per cent, and only 4·2 per cent between the latter figure and 40s., while this rate is exceeded by 2·4 per cent. Only one in a thousand gets less than 10s., and be it remembered the classification includes helpers in all the trades. As to women, 26 per cent have less than 10s., 50 per cent between 10s. and 15s., and 18·5 per cent between 15s. and 20s., while 5·5 per cent have more.

Another interesting point is the relation of the average wages in England, Scotland, and Ireland. It is not altogether surprising to learn that wages are lower in Scotland than in England by about 10 per cent, and that in Ireland they are still lower, the difference, as compared with England, being from 16 to 20 per cent, and more in those trades where the proportion of unskilled to skilled workers is greatest, for the report shows that skilled labor is paid about the same as in England, while mere muscular labor is very cheap. That is a condition which is easily understood. Some of the figures from the report may be quoted:

AVERAGE ANNUAL WAGE.

Trades.	England.	Scotland.	Ireland.	United Kingdom.
	£ s.	£ s.	£ s.	£ s.
Engineering	58 14	54 9	45 18	56 19
Metal work	59 12	54 15	51 2	57 19
Sawmills	57 15	52 9	49 13	55 14
Coachbuilding	57 8	53 4	52 18	56 6
Breweries	61 17	54 17	50 13	60 15
Distilleries	64 9	52 5	47 4	52 12
Chemical works	58 12	50 0	47 0	55 18
Printing—large works	55 9	47 0	44 3	52 11
" —small "	44 1	41 19	36 17	43 8
Building trades	72 0	63 0	61 0	—

These figures are based on the assumption that the men work full time.

Moving a Large Factory.

In the work of track elevation on the Providence division of the New York, New Haven and Hartford, it became necessary to move one of the largest factory buildings of the Sturtevant Blower Works at Jamaica Plain. This building is 50 × 350 feet, about half the length of which has three and the other half two stories. The three-story portion was moved about 50 feet east and 300 feet south, and the other portion was moved 50 feet east from its former location. The work in the three-story section, except upon the lower floor, was carried on all of the time during the removal, power being supplied by a 20 horse power electric motor belted from the second floor of the building to the main line of shafting. Provision was made for moving the motor away from the generator, which was situated in the engine room, by placing a reel containing the conducting wire upon the floor of the moving building, which allowed the wire to unwind and made it possible to keep the motor running while the building was upon the rollers. The moving was carried out in the usual way by means of capstans worked by horse power, which were connected to the building by ropes and blocks. The building was thoroughly tied in both directions by heavy iron rods before the moving was commenced, and though the walls of the first story are 20 inches thick, and of the second story 16 inches thick, the work was done without injury to the structure, in spite of the fact that the latter part of the journey was over filled ground.—The Boston Herald.

© 1895 SCIENTIFIC AMERICAN, INC.

The Cotton States Exposition.

The Cotton States Exposition has now been open to the public 15 days and yet the visitor finds much still to be done to make a tour of the grounds with comfort. The roads and walks are very far from the condition of roadway "that leads down to destruction," spoken of in Scripture. The poor sinner who foots his way from the entrance to the exit takes on a goodly load of dust, besides going over acres of corn-racking broken stone. The management cannot be wholly blamed for this, as labor in this section is not only less abundant, but also less to be depended upon than in northern localities.

The exhibits in the various buildings are assuming shape, and are certainly very creditable, though much is still to be done in this respect. The most complete of all is the United States exhibit, including the Fisheries Commission, in the same building.

The display of varieties of living fish in glass tanks is tasteful in arrangement, and very instructive in conception. The building set apart for and filled with the efforts of Negro genius and skill is also very near completion and worthily attracts much attention; not necessarily for its great perfection in finish of exhibits, or new fields of progress, but that the emancipated race has been able to "climb up the stair" of ability in so short a period of freedom.

The observer sees, necessarily, plagiarism in all their works of art and mechanics, while yet feeling a hearty sympathy in their laborious education.

That the "expert" will never fear the efforts of the novice is so plainly written in this and—I dread to say it—the woman's building, he who runs may read. As the plot of the exposition develops itself, I will write, be it tragedy or comedy. Whether the experiment of a successful exhibition, with ear muffs and chilblains as companions, will be possible, remains as the deciding side of the result.

October 9 was a "banner day" at the fair; the attendance was very great: cause—arrival of the old "Independence Bell" from Philadelphia.

I was much pleased with the exhibit of acetylene gas (made from the union of lime and coal by heat). It is compressed into liquid form in steel cylinders about 4 inches in diameter by 4 feet long. Each cylinder, which can be taken to any household and attached to the pipes, it is claimed, contains enough liquid gas to run six burners three hours in the evening for a month. In this form there is, of course, no residue.

They attract much attention, as the white flames they burn constantly show the beauty of the light and the absolute simplicity of operation. The exhibitors say that experiments in manufacture so far justify the statement that $10 per ton will be a maximum cost of the compound, but others say the cost is far greater.

MEAD.

The Rubber Stamp Industry.

BY GUSTAV HEINSOHN.

While a single rubber stamp may appear insignificant, and it costs a trifle, the trade in goods of this class has reached a very large aggregate and become a source of profit to a great number of persons. It is the most widely distributed of all the branches of rubber manufacture, geographically speaking. One must consider that when the business man of Nagpur or Melbourne or Rio de Janeiro or Bankipore uses a rubber stamp it is not due to that article having reached him by accident from a distant country; the letters have been moulded and the stamp vulcanized in a shop in his own city. The United States is the home of the rubber stamp, and the largest production of such goods is still to be found here, but there is no export business to speak of. The most that can be done in the direction of foreign trade is to operate through foreign branches, or to arrange for the collection of royalties from manufacturers abroad under American patents. But rubber stamps are made and used already far beyond the limits of patent protection—that is, in countries without patent laws.

How many rubber stamps are made or used is past finding out. It is safe to say that few up-to-date business men have not sometimes a use for a rubber stamp, while in a single office hundreds of different stamps may be used. One needs only to look at the bank checks which pass through any large business house every day, with their stamped indorsements, and often with stamped signatures, to gain an idea that an enormous number of stamps must be in use. By the way, the banks are among the most valuable customers of the rubber stamp manufacturer. Two years ago the Chemical National Bank of New York, it is said, gave one order for 7,000 rubber stamps, though of course this was exceptional, the occasion being a monetary panic when clearing house certificates were issued and very much unusual work was necessary in conducting the banking business. Insurance and other companies having a great number of agents, patent medicine manufacturers whose compounds are sold through thousands of dealers, and many other concerns have rubber stamps made for their agents, whose names are stamped on the advertising matter which is pouring ceaselessly through the presses. Printing the names of agents on circulars, cards, etc., with type, which would have to be changed for every name, would be much more expensive.

Like most things which have any value at all, the rubber stamp has been improved from time to time until it is now capable of many more uses than at the beginning. On account of a new feature which will be described further on, the rubber stamp is coming into use for lettering boxes and packages, instead of the old-fashioned stencil plate, with the result of saving a great deal of time, besides securing a better label in many cases. Where a merchant ships goods frequently to the same customer, a rubber stamp can be obtained for marking packages with the customer's name and address, with far greater satisfaction than from the use of marking pot and brush. As rubber stamps are now manufactured, there is a steady increase in practicable sizes. "Hand stamps" 10 × 14 inches are now advertised, and they have proved as satisfactory in use as the one-line stamp with which the name of a corporation is affixed to a bank check over the treasurer's signature. Nor are these stamps confined to the printing of letters or figures. One of the big typewriter companies recently had a 10 × 12 inch rubber stamp made, embracing a good representation of their machine, made from a photograph, and this is stamped on the boxes in which the machines are sent out to the trade.

The trade in rubber stamps has been not a little stimulated by the invention of the pneumatic feature, by which the stamp is rendered flexible. The advantage of the improved stamp is that it will print on any surface, whether flat, uneven, concave, convex, or yielding, such as pasteboard boxes, packages prepared for the mails, etc. It is due to the flexible feature, indeed, that the large sized rubber stamps above referred to have come into existence, since the stamps formerly made could be satisfactorily used only on surfaces that were exactly level and uniformly smooth.

In the manufacture of rubber stamps a form of printing type is set up, styles of letter being selected such as it is desired to reproduce in the rubber, and a cast of the type faces taken to serve as a matrix or model for the rubber. When the mould has hardened sufficiently, a sheet of unvulcanized rubber is forced into it by hydraulic or other pressure, with the result that, when the rubber is removed, it presents a facsimile of the type metal letters. By vulcanizing the rubber its quality becomes fixed, and the letters retain their form permanently. The cementing of the rubber letters to the handle or "mount" is done with some preparation the nature of which is usually guarded as a secret. The manufacture of the air cushion mount involves an interesting feature. There is first secured a rubber sheet or cushion, on one side of which is a series of cells, similar in appearance to a piece of honeycomb, except that the cells are square or oblong instead of hexagonal. These are the air cells, and they will be probably one-fourth inch deep and as large square, though various sizes are used for different kinds of work. The printing surface, or rubber die, is first securely cemented upon the back or closed side of a sheet of the cells. The opposite or open side is then hermetically sealed by cementing it to another flat piece of rubber, or direct upon the stamp handle base, thus forming airtight compartments, which, under pressure, give flexibility to the printing surface and allow it to conform to any surface on which it is desired to print. The advantage of having a number of small cells is that the delicate separating walls all assist in supporting the rubber printing surface and giving it the necessary firmness. Besides, if a few cells should in time become broken, the stamp will not thereby lose its form. Unlike the pneumatic bicycle tire, the pneumatic rubber stamp is not rendered useless by a puncture, since the inflation or distension of the cells is not necessary to render the stamp effective.

Closely related to the rubber stamp trade is the manufacture of solid rubber type. There are many cases where it is desirable to change frequently the matter to be printed, or stamped, and for this reason a demand has grown up for rubber letters which can be rearranged as often as desired. Formerly the frames or mounts into which were inserted the feet of the rubber type—so to speak—were provided with thumbscrews for holding them in place. Too frequently, however, such screws were apt to be tightened so far as to compress the types, resulting in bad work in printing. An improvement was devised to overcome this, by means of which each letter, as it is put in place, is compressed with a pair of pincers, the base of the letter expanding and filling the socket completely as the pressure of the tool is removed. Thus the letters are prevented from falling out of the handle. But the chief improvement in connection with rubber type work has been in the adaptation to it of the pneumatic mount, so that a form of rubber type is now used precisely as a flexible hand stamp would be.—India Rubber World.

THE largest library is in Paris, the National, containing 2,200,000 volumes.

Science Notes.

Gilded Fabrics.—For some time past gilded or silvered tulles have been in the market. According to Mr. Villon, the following is the process of preparing these fabrics: The tulle is immersed in a one per cent solution of nitrate of silver. After a quarter of an hour it is dried and then plunged into a solution of Raschig salt. This latter is a salt of potassium of sulphonated hydroxyiamine. The nitrate is immediately reduced, and the silver deposits upon the fibers in impermeabilizing them. It then only remains to dry the tulle, wash it, and dry it anew. This done, it is covered with gold or silver in a galvanic bath formed of double cyanide of potassium and gold or silver. The same process may be used for silvering or gilding other fabrics.

A New Tannin Plant.—Mr. H. Trimble calls attention in Garden and Forest to a tree that is yet little known, but which seems capable of rendering great services as a source of tannin. This is the Castanopsis, a tree intermediate between the oak and the chestnut. A species of this tree, C. chrysophylla, is found in California and Oregon. Its bark is very rich in tannin, as may be seen from a comparison of the following analyses:

	Water, per cent.	Dry tannin.	Ashes.
Castanopsis (bark)	42·72	18·92	3·70
" (wood)	9·75	3·67	0·72
Quercus densiflora (bark)	10·31	16·12	2·46
Ostrya virginiana (bark)	20·41	6·49	8·47

Although this tree does not form forests in California, it is nevertheless of comparative frequency and grows to a great height. It would seem advantageous to develop the culture of it for the industrial preparation of tannin.

Lighting by Luminescence.—In a paper read by Mr. A. Witz, before the Academy of Sciences, the author gives the results of his attempts to measure the quantity of energy necessary to illuminate Geissler tubes. The figures that he has obtained show that, in lighting by luminescence, the proportion of calorific energy as compared with the total energy is more feeble than in any other luminous source.

The author thinks that by reducing the losses of electricity to a minimum, by concentrating the light in a confined space, by utilizing the fluorescence of certain substances, and, finally, by devising certain special arrangements, one may hope to obtain luminous sources whose photogenic rendering will be superior to the best now known.

Cycle Notes.

In the smaller towns in France, when a fire breaks out, a messenger has to make the rounds of the town summoning the firemen from their work. These messengers are now mounted on bicycles, and are able to summon the firemen in a much shorter time than formerly.

A New York magistrate has decided that the repairing of a punctured tire is a necessity. Wheelmen have long held this idea, but it was not until a man was arrested for violating the Sunday law by repairing a puncture that the court finally rendered judgment on this important question.

An English cycle insurance company has a reference department, which should be of great value to the intending purchaser of a second-hand wheel. If the machine has been insured in the company, the would-be buyer, upon the payment of a fee of twenty-five cents, will be given all particulars of the age, make, and original price of the machine, and whether any or what accidents the company has been called upon to pay upon it while it was insured with them. By this means the purchaser is in a large measure protected against buying a stolen or misrepresented wheel.

Responses from the leading manufacturers of the country place the output of wheels for 1895 anywhere from 400,000 to 750,000, and that of 1896 from 600,000 to 1,000,000. A fair average of those opinions would bring the prophecy for 1896 to near 750,000 wheels. The general opinion is that prices will remain about the same as 1895.

The Board of Education of Montclair, N. J., has taken formal recognition of bicycles as a means of going to and from school. At a recent meeting the fact that between seventy five and one hundred children rode to school every morning on bicycles and that some accommodation should be provided for the wheels was considered. The board then ordered that racks for the wheels be put in the different schools.

Complaint has been made that cycling is keeping the young and old away from church. In the suburbs of London a minister of the Gospel preaches a special sermon in his church for the benefit of cyclists. Every Sunday the wheelmen ride out to the church from the city, and the minister is said to have close and attentive audiences. The same plan has also been tried in this country with success.

The Jersey City Board of Aldermen, on October 8, passed Alderman McCarthy's ordinance, which provides for the imposition of a $25 fine on any person who throws tacks, pieces of glass or other like material in the public highways. The object of the ordinance is to prevent the puncturing of bicycle tires.

© 1895 SCIENTIFIC AMERICAN, INC.

Eleusian Remains.

The Standard states that the excavations that are being carried out by the Greek Archæological Society on the site of ancient Eleusis, a few miles from Athens, have just yielded some results of exceptional importance. In a very ancient and well preserved tomb there have been found, in addition to the skeleton of a woman, a number of articles, including ear-rings of fine gold, silver and bronze, several finger rings, sixty-eight small vases of various shapes in terra cotta, two tripods, three Egyptian scarabæi and a small statuette of the goddess Isis in porcelain. These discoveries leave no doubt of the fact that the celebrated mysteries of Eleusis were of Egyptian origin, and were borrowed from the religious rites of the ancient Egyptians. These important relics have been deposited in the National Museum.

IMPROVED "LONG RUN" PERFECTING PRINTING PRESS.

For some time past there has been quietly running in the city of Boston a press which printers who have seen it say is destined to revolutionize the printing of such jobs as are known generically in the trade as "long runs" of book and cut work.

To describe the machine in the fewest words, it is a web perfecting press with patent offset mechanism. It is manufactured by C. B. Cottrell & Sons Company and is the invention of the former senior member of that house, now deceased.

As shown in our engraving, the new machine in appearance is strong, symmetrical, evenly proportioned, ideal in shape and design. There is no important part of the press which is not easily accessible, the location of parts being well-nigh perfect in arrangement.

It is a press for printing fine work by automatic feeding from a continuous roll of paper; prints both sides of the sheet at one operation; and is so constructed that there is no offset in the printing of the second side.

This last consideration is one of the most important features of the new press, for it adds the virtue of quality to that of speed.

The surface of the second impression cylinder is in four sections and is covered by four tympans supplied from rolls of paper within the cylinder. These tympans are set to shift automatically at stated intervals. The movement is not slow, partial and continuous, but quick, complete and instantaneous. The entire tympan covering of the cylinder shifts in one revolution, moving the full length of the printed surface. This is done with no diminution in the speed of the press and no cessation of its printing.

Furthermore, this shifting of the tympan can be adjusted to suit the special needs of each job. Thus, the surface may be changed automatically after every eighty impressions, if heavy cuts are in the form, or it may be set to wind off on 160 impressions or on 240 if the work is ordinary book or pamphlet printing.

The paper, after printing, is cut into sheets and delivered (accurately jogged both ways) on the table. There are no tapes and no fly. The delivery is positive and in its operation the sheet has no printed surface contact.

The cutter is rotary, makes a sheer cut and leaves the edges perfectly square and smooth.

The press prints a 33 × 46 sheet, running at a conservative speed of 3,500 completed sheets per hour—equal to 7,000 impressions on one side.

Altogether, the Cottrell web perfecting press, with offset mechanism, may fairly be ranked among the great achievements in printing machinery of the present day.

GYROGRAPH OR ARTISTIC TOP.

Our engraving shows a novelty in tops recently added to the long list of interesting modifications of this old-time toy.

The novelty in the present case consists in making the point upon which the top spins produce a record of its movements.

The top consists of a heavy disk of iron secured to a spool on which to wind the string. The spool is bored axially to receive a pencil which forms the point on

THE GYROGRAPH.

which the top spins. The handle is swiveled so that the top may be spun while the handle is held in the hand. After the top is set in motion, it is placed on a paper in the position shown in the engraving. The pencil point then traces the intricate curves as shown.

If desired, a slate pencil can be substituted for the lead pencil. The manufacturers state that a well centered hard pencil with the lead cut square across gives the most accurate curves, though not necessarily the most beautiful.

Breeding Habits of Toads.

It was stated that a correspondent of Meehan's Monthly inquired how it was possible to find toads no larger than peas if the tadpole is the first stage of toad life. The reply of the Monthly was to the effect that toads are oviparous or viviparous, according as water is or is not accessible. This is not quite true.

Every toad passes through the tadpole stage, however far he may be from the water, and no case is known of a toad bearing young alive, but all toads and frogs lay eggs. It is true that some forms pass through the tadpole stage while still in the egg, and others carry their young in various ways until the tadpole period is passed, but none of them ever bear young alive, as viviparous in its true sense would imply.

It may be interesting to note some of the curious breeding habits of toads. The remarkable toad of South America, Pipa americana, is the most extraordinary. The eggs are laid by the female, and are immediately transferred by the male to the back of the female, to which they adhere and where they are impregnated. The skin of the back is excited into increased activity by the presence of the eggs, and gradually grows up around each egg, until it is inclosed in a pouch.

Here the eggs develop, passing through the tadpole stage, and when the form of the adult is reached the little fellows emerge and take up an independent existence. Pouches filled with eggs, to the number of one hundred and fourteen, have been observed on the back of a single female. This is the only case among the Batrachia in which the young are nourished at the expense of the parent, but even this toad could not be called viviparous.

Another interesting form is the obstetrical toad of middle Europe. The eggs are laid by the female in a long albuminous string which is taken by the male and wound about his body and thighs. The albumen dries and the eggs become fastened to his body and there remain until hatched.

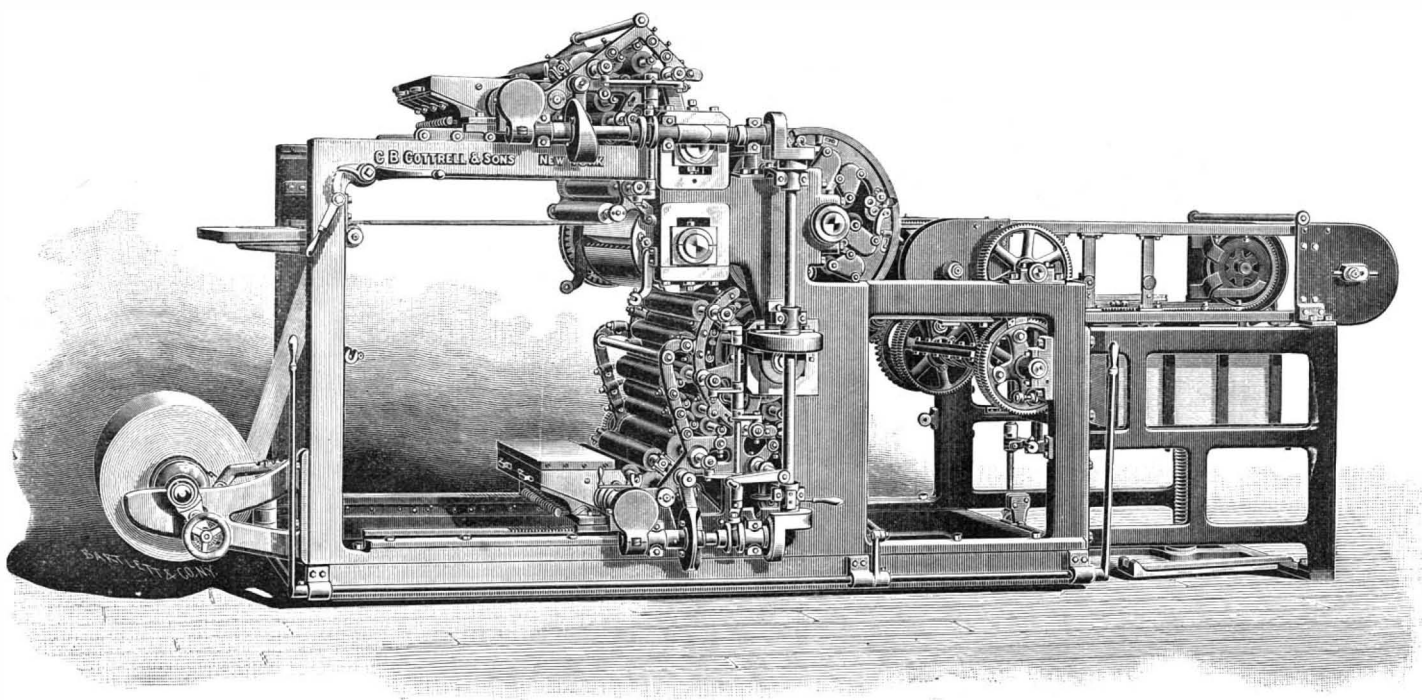
The species Nototrema and Opisthodelphys, of Peru, carry their eggs in a pocket formed by the unfolding of the skin of the back; the young of the former leave the egg while tadpoles, those of the latter pass through their entire metamorphoses while in the pouch.

Our own toads deposit their eggs in long albuminous strings having the appearance of a necklace of black beads. The eggs of the frogs and salamanders are deposited in more or less globular masses of the albuminous substance. We may distinguish the eggs of the salamanders from those of the frogs, for the former have a circular outer envelope which surrounds each egg.

The tadpoles of the toad, unlike those of the frog and salamander, retain their early black color throughout their larval state. They also undergo their metamorphoses while much smaller than the frog. The toad tadpoles take on the adult form when they are literally not larger than peas. At this stage they leave the water in great numbers and make long journeys in every direction, traveling mostly at night, but often emerging from their hiding places after a rain, thus giving rise to the suspicion that they have fallen with the rain.

The hylidæ or tree toads lay their eggs in the water, in small pockets, and not in strings as do the other toads. They also undergo their metamorphoses while small. One of the Mexican tree toads is said to deposit its eggs in the water which accumulates in the axils of leaves and to undergo its changes high above the ground.

In the spring of the year nearly every pond and pool will be found on careful search to contain numerous masses of albuminous jelly filled with eggs in various stages of development. Nothing is more interesting than to bring home these eggs and watch them develop from day to day. Whether they be the eggs of frogs or salamanders, or the strings of toads' eggs, we shall see them all hatch into lively little tadpoles. We can scarcely hope to keep the frog or salamander tadpoles until their legs bud forth and they become ready to live on land, for it requires too long a time, but we may keep the toad tadpoles and watch the limbs gradually appear and the tail disappear until the adult form is reached. The little tadpoles will devour the slime which gathers on the sides of the aquarium, and they will also suck the juices of raw meat. They grow rapidly and in a short time acquire legs and lose their tails, and though still no larger than peas, they are perfectly formed toads ready to take up a terrestrial life.—F. P. G., in Outdoor World.



IMPROVED "LONG RUN" PERFECTING PRINTING PRESS.

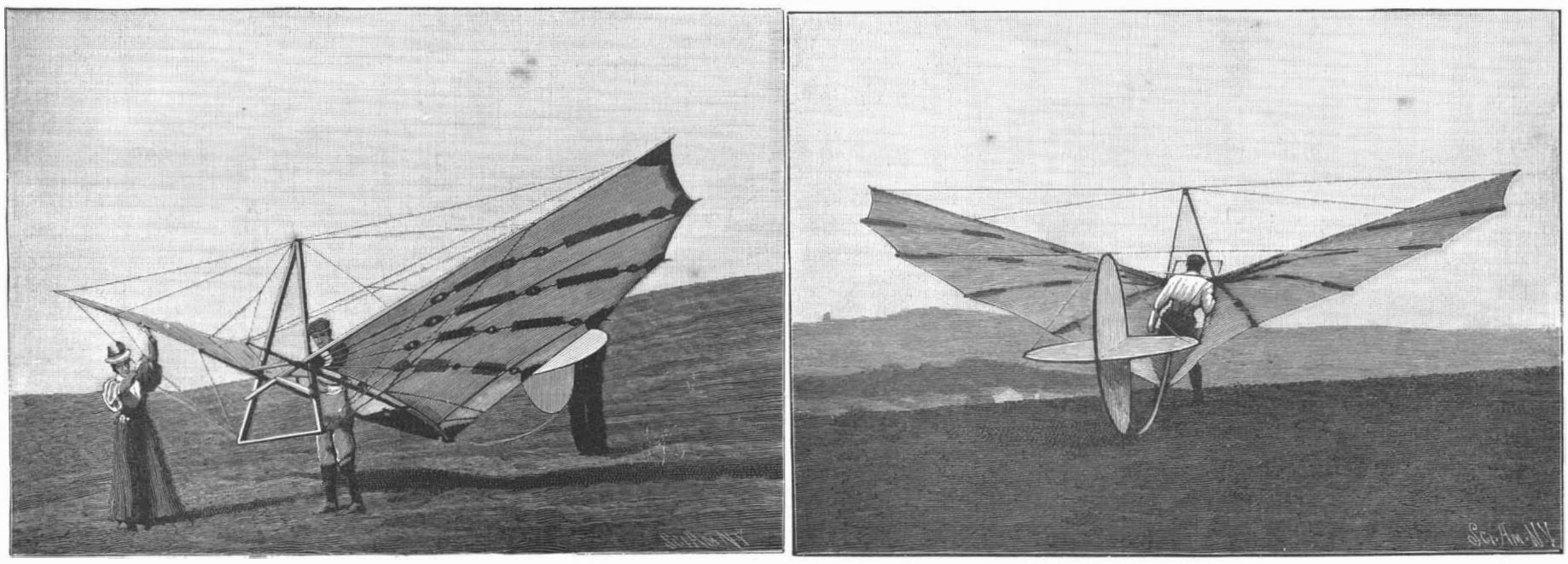
A REUTER'S telegram of September 11, from Berne, reported the fall of a huge mass of ice from the Altels Glacier upon the hamlet of Spitalmatte, in the Upper Gemmi Pass, causing the death of at least ten persons and the loss of, it is estimated, two hundred head of cattle. A stretch of land nearly two miles in length has been overwhelmed and the pass has been partially blocked.

© 1895 SCIENTIFIC AMERICAN, INC.

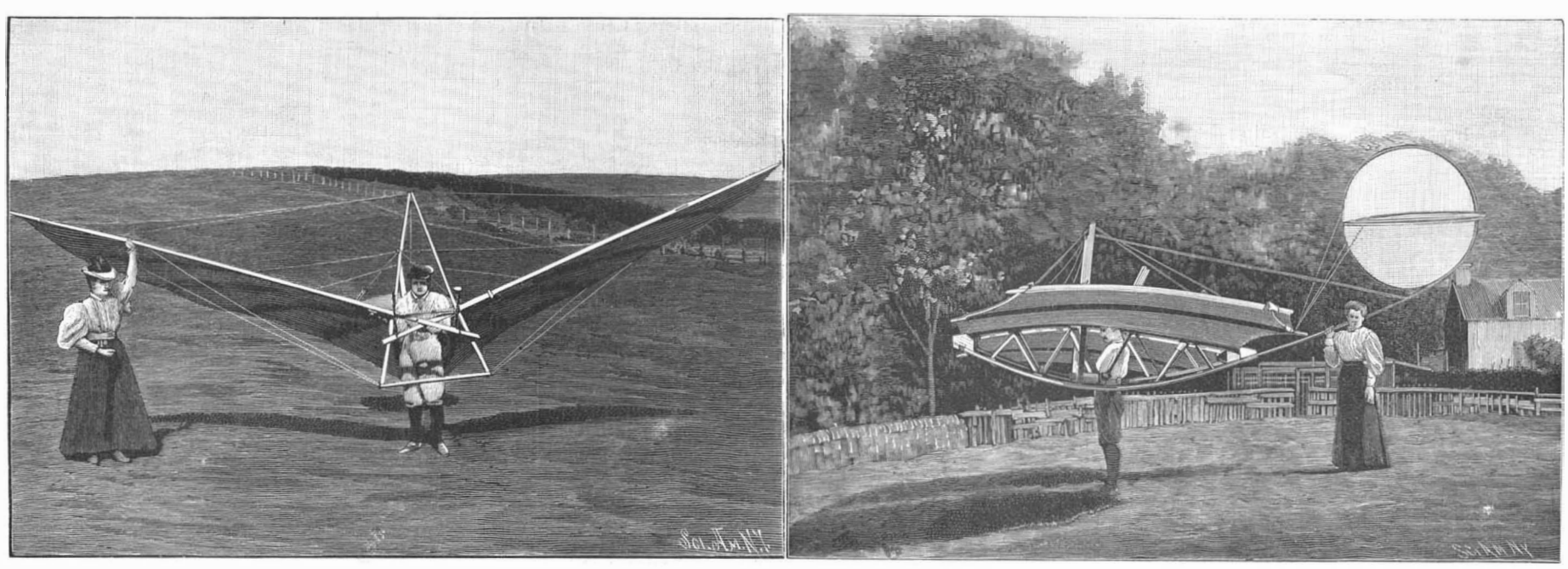
NEW FLYING MACHINE.

Our readers will recollect that we devoted some attention in the past to Herr Lilienthal, of Berlin, and his experiments in soaring. Now it is Mr. Percy S. Pilcher, Lecturer on Marine Engineering at Glasgow University, who, basing his inventions upon that of Herr Lilienthal, has produced two winged creations, and by their aid has taken sundry flights in midair. At times he has risen to an altitude of twenty feet, occasionally hovered kite-like for a space and then descended on the spot he left; while, upon other trials, he has hastened before the breeze for considerable distances ere regaining his feet. Mr. Pilcher's machines are light structures of wood and steel supporting a vast spread of wing and braced with piano wire. The wings themselves, which are made of nainsook—a sort of muslin originally manufactured in India—have an area of 150 square feet; and each machine, as our pictures indicate, possesses a vertical and horizontal rudder of circular shape, the one cutting the other at right angles. The former, which is rigid, serves to keep the machine's head to the wind, while the latter arrests an inclination to pitch sideways—a common vice in all like inventions.

The great difficulty with winged aeronauts is the uncertain quality of the wind, for a steady, unvarying breeze is never to be calculated upon. Indeed, the sudden, unexpected side puff often brought disaster in its train to Mr. Pilcher until he hit upon a means of circumventing it. He now draws his wing tips in with a bend, which renders a flying machine safer and more stable. Speaking generally, these experiments in flying or soaring are being made with a view to master the art of aerial balance and safe landing. Then, when the golden era dawns, when a screw propeller or flapping wings are introduced, and a power discovered to work them, gentlemen like Messrs. Lilienthal and Pilcher will spring gayly aloft to emulate the carrier or tumbler pigeon, and put a girdle round the earth in a morning. May the necessary discovery of a new power be speedily made! Meantime Mr. Pilcher, on a fresh pair of wings with a sail area of no less than 300 feet, pursues his plucky experiments at Cardross, in Dumbartonshire, before numerous admirers.—From Black and White.



THE PILCHER FLYING MACHINE.



THE LATEST FORM OF FLYING MACHINE.

Luminescence.

What has generally been called phosphorescence is well known to be the effect of oxidation in the case of phosphorus itself, and in that of decaying wood or other organic matter which under certain conditions shines in the dark. Wiedemann has shown that the shining of Balmain's luminous paint, and generally of the sulphides of the alkaline earths, is accompanied with chemical action. A long period of luminosity after the removal of the source renders highly probable the existence of what he now calls chemi-luminescence. A large number of substances, both inorganic and organic, have been examined both by direct action of light and by the action of cathode rays in a controllable vacuum tube through which sparks from a powerful electrical influence machine were passed. Careful examination with appropriate reagents before and after exposure was sufficient to determine whether any chemical change had been produced. Thus the neutral chlorides of sodium and potassium, after being rendered luminous by action of cathode rays, were thereby reduced to the condition of subchloride, so as to give a distinctly alkaline reaction. Many substances, moreover, which manifest no luminescence at ordinary temperatures after exposure, or which do so for only a short time, become distinctly luminescent when warmed. This striking phenomenon is sufficient to warrant the use of a special name, thermo-luminescence. Among such substances may be named the well known sulphides of the alkaline earths, the haloid salts of the alkali metals, a series of salts of the zinc and alkaline earth groups, various compounds with aluminum, and various kinds of glass. Some of these after exposure give intense colors when heated, even after the lapse of days or weeks. That the vibratory motion corresponding to the absorption of luminous energy should maintain itself for so long a time as a mere physical process is highly improbable, if not unparalleled. That it should become locked up, to be subsequently evoked by warming, certainly indicates the storing of chemical energy, just as the storage battery constitutes a chemical accumulator of electrical energy. Other indications that luminescence is as much a chemical as a physical phenomenon are found in the fact that the sudden solution of certain substances is accompanied by the manifestation of light, if they have been previously subjected to luminous radiation, but not otherwise; that alteration of color is brought about by such exposure; and that friction or crushing may cause momentary shining in such bodies as sugar. There is no conclusive direct evidence thus far that such luminescence as vanishes instantly upon the withdrawal of light is accompanied by chemical action. But Becquerel demonstrated long ago with his phosphoroscope that there is a measurable duration of luminous effect when to the unaided eye the disappearance seems instantaneous.* Wiedemann now shows that when this duration is considerable there is generally chemical change. Since duration is only a relative term, it seems highly probable that even cases of instantaneous luminescence, commonly called fluorescence, are accompanied with chemical action on a very minute scale, and that all luminescence is therefore jointly physical and chemical in character. We have thus color evoked by the direct action of light, which disturbs the atomic equilibrium that existed before exposure, and the manifestation of such color continues only until the cessation of the chemical action thus brought into play.

The influence of very low temperature upon luminescence and photographic action has been studied by Dewar.† The effect of light upon a photographic plate at the temperature of liquid air — 180° C. is reduced to only a fifth of what it is at ordinary temperature; and at —200° the reduction is still greater, while all other kinds of chemical action cease. In like manner, at —80° calcium sulphide ceases to be luminescent; but, if illuminated at this low temperature and then warmed, it gives out light. At the temperature of liquid air many substances manifest luminescence which ordinarily seem almost incapable of it; such are gelatine, ivory, and even pure water.—W. Le Conte Stevens.

AUSTRALIA has a population of less than 5,000,000, but economists declare it could support 100,000,000 with ease.

* Becquerel, Comptes Rendus, xcvi, 121.

† Chemical News, lxx, p. 252, 1894.

© 1895 SCIENTIFIC AMERICAN, INC.

Horseless Carriages in France.

The time seems approaching when automatic road carriages, propelled by steam, electricity, or petroleum, will come into general use and take away from the patient horse the worst part of his daily toil. The odds, at present, seem to be rather in favor of petroleum. A most interesting competition has recently taken place in France between varied specimens of motor carriages. The course prescribed was from Paris to Bordeaux—a distance of 358 miles—and back again, any vehicle to stand disqualified if it consumed more than one hundred hours on the road. The big prize of the day—40,000 francs ($7,720)—was for four-seated carriages, which was won by Les Fils de Peugeot Frères, while Messrs. Panhard & Levassor secured second place with a two-seated carriage, making the round trip in twenty-four hours and fifty-three minutes.

The winning conveyances were propelled by gasoline, and the rate of speed was about 15 miles an hour, which is regarded as an extremely creditable performance, the long lines of hills being taken into account. These hills appear to have proved too much for the carriages propelled by electricity, of which only one got through, the others having abandoned the contest. One of the steam carriages was brought to a standstill at Versailles early in the race, owing to an accident, and the others lost time by frequent stoppages of five and ten minutes, made for the purpose of taking in coal and water. The electrical conveyances had also to stop, from time to time, to renew their dynamic charges, but the petroleum machines carried enough force for a twenty-four hours' run, and on the return journey the run was made without a single stop. In comparing the merits of the different propelling agents, the palm must, so far, be awarded to petroleum, which is clean and can be easily carried. The ordinary feeder used for short distances contains less than 4 quarts of oil, which will last over a journey of 20 miles, or two and one-half hours. For long distances, a receptacle capable of holding enough petroleum for a run of at least twenty or twenty-four hours is provided.

We hear also of bicycles propelled by petroleum, in which great interest has been exhibited, and half a dozen of such machines started in the race to Bordeaux, one, at least, holding its own among the larger vehicles. It is believed that light petroleum bicycles, tricycles and even four-wheelers, will soon come into general use, which will tend to relieve lady cyclists from the necessity of wearing short skirts. Altogether, it seems that petroleum is destined to become the popular agent for solving the problem of traffic and conveyances without horses in the streets of great cities and on smooth country roads.

It has already made astonishing headway in the uses and industries of the world. In Japan it has become almost the sole illuminant, and on the Caspian Sea the Russian steamers burn nothing else for their engines.

In commenting on the success of the horseless vehicles propelled by petroleum, in the race between Paris and Bordeaux, a leading English journal says:

"Why is it that we are so slow in this country to take up improvements of such immense social importance? Ours is the land of machines and machinery, of skilled inventors and colossal enterprises, yet in many respects England lags behind the whole civilized world in availing herself of the discoveries of science. There is not as much use made in the whole of London of the telephone as in one single quarter of Washington City, and there are prairie towns in the west of the United States more magnificently lighted by electricity than the best street of London. Electric tram cars and tram cables may be seen in many and many a city abroad, while here they are still novelties. Years ago the tourist might have watched a detached electric or petroleum phaeton quickly threading the thickest crowd of carriages in the Place de l'Opéra, at Paris; and now we have Frenchmen again, instead of the countrymen of Watt and of Stephenson, acting as pioneers to the new age which will certainly effect the deliverance of great cities from horse traffic, and of the horses themselves from a cruel and destructive use of their strength.

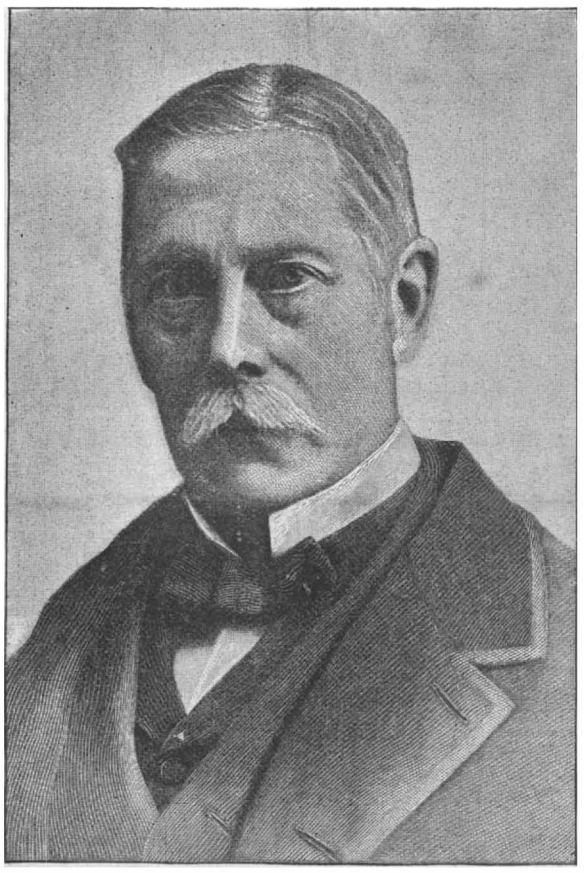
"It is a circumstance which has been frequently commented on, that there are no horseless conveyances other than cycles and a few cable tram cars in London. The reason is said to be that the law restricts the adoption of horseless vehicles in England to a very great extent. They are all subject to conditions upon which alone locomotives of primitive construction, steam rollers, etc., are suffered to go through the streets. A man must go before with a red flag, and the speed must be under four miles in the country or two in the town. The restriction was probably very well before the days of rapid transit, and it may be very well yet in its application to heavy locomotives. It was no doubt intended to guard against accidents due to the frightening of horses. But horses, like human beings, soon become accustomed to new and strange sights, and are nowadays seldom frightened even by the railway locomotive; besides, it is absurd to class a light carriage with a road locomotive or steam roller, because its motive power is steam, gas, petroleum, or electricity. But since the successful experiments recently made in France, London seems to have caught the gleam of a ray of hope that horseless cabs and omnibuses may soon be seen in her streets. Mr. Shaw-Lefevre, president of the local government board, has introduced into the House of Commons a bill intended to permit such carriages to be used, and they will no doubt soon become a common sight in the streets of London, as they are now in the streets of Paris, Havre, and other French cities."

C. W. CHANCELLOR, Consul.

Havre, June 24, 1895.

SIR DOUGLAS GALTON, PRESIDENT OF THE BRITISH ASSOCIATION.

Captain Sir Douglas Galton occupies the honorable post of president of the British Association in succession to the Marquis of Salisbury. He has justified his selection for this compliment by long and valuable services in various fields. Son of the late Mr. J. H. Galton, of Worcester, he was born in 1823. He was educated at Rugby and at the Royal Military Academy, Woolwich. Having joined the Royal Engineers, Douglas Galton soon showed his abilities. He had to do with the removal of the wrecked Royal George before he was twenty; then he served in the Mediterranean and on the Ordnance Survey. The first of a long series of secretariats began in 1848, when he acted in this capacity on a royal commission relating to the



SIR DOUGLAS GALTON, PRESIDENT OF THE BRITISH ASSOCIATION.

use of iron in railways. He next was appointed Inspector of Railways; in 1857 Chairman of the Commission dealing with submarine cables; and in 1862 Assistant Under-Secretary for War. But merely to recount all Captain Galton's services would be wearisome. He has had connection with commissions and congresses innumerable, while for twenty years he has been General Secretary of the British Association, over which he will soon be presiding at Ipswich. He was created C.B. 1865, and knighted in the Jubilee year. Sir Douglas has managed, by genial suavity allied to wide knowledge, to accomplish excellent work, as well as to make many friends.—Illustrated London News.

Teaching of English in College.

Disgraceful is a strong word, but, in the opinion of Professor Goodwin, of Harvard, it is a proper word to apply to conditions in his own and other similar institutions. "The college," he says, "must do something to redeem herself from disgrace," the disgrace being the paltry knowledge of the English language possessed by many of the students. Equally severe criticism is made, on the same point, of Uncle Sam's Military Academy at West Point, by the Board of Visitors for the year 1894. While highly commending the work of this institution in many respects, the Board's report laments the "lack of facility of expression" on the part of many of the cadets. The Committee on Discipline and Instruction were "painfully impressed" by the English examination, and recommended that more time be given to this language and its literature, only two hundred and ten hours being allotted to such study during the four years' course. The Visiting Committee on Composition and Rhetoric of Harvard University made similar criticism with respect to that institution in 1892 and again in 1894. Commenting on these facts, the Public Ledger, Philadelphia, says editorially:

"The responsibility for this regrettable state of affairs rests partly upon the colleges and universities, and partly upon the preparatory schools. The West Point Visiting Board recommend a more stringent English entrance examination, and if all the universities would insist upon this, the preparatory schools would give more attention to the subject. As long as it is assumed that the student has been well taught in English before he enters college, the preparatory schools will exploit foreign languages and the higher mathematics at the expense of English. The universities cannot be expected to instruct students in the fundamental principles of the mother tongue; but they can, and should, insist upon a searching examination in English when the student applies for admission.

"It has been said with great force that nobody can be thoroughly grounded in his native tongue unless he has some knowledge of a foreign one; but the first duty of the academies is to teach our youth how to use the language of Milton and Shakespeare with propriety, if not with elegance. That there is great need for better English instruction in all our schools is quite evident. The ordinary vernacular of the street shows that plainly enough, and the youth who can write a flawless English letter of any length is an exception. Our tongue does not come to all of us in its purity like an inspiration. If we would learn its peculiarities and show its pitfalls, we must make it the study of a lifetime and must lay a good foundation at a very early age."

[FROM NATURE.]

Alteration in the Colors of Flowers by Cyanide Fumes.

It is well known that the yellows of some insects are turned to red by the fumes from potassium cyanide; but I have not, after some inquiry, been able to obtain any literature describing the effects of such fumes upon the colors of flowers. The reactions I have observed are very curious, and while it seems improbable that they are hitherto wholly unknown, it may not be amiss to direct attention to them.

A few lumps of the cyanide are placed in a corked tube covered with a little cotton, and the flowers are placed on the cotton. It is probably necessary that the day should be hot or the tube slightly warmed. The pink flowers of Cleome integrifolia and Monarda fistulosa turn to a brilliant green-blue and finally become pale yellow. A purple-red verbena becomes bright blue, then pale yellow. The purple flowers of Solanum sloagnifolium go green-blue and then yellow. The white petals of Argemone platyceras turn yellow, the natural color of A. mexicana. The pale yellowish flowers of Mentzelia nuda turn a deeper yellow. Flowers of Lupinus argenteus, var., turn pale yellow. White elder (Sambucus) flowers turn yellow. The scarlet flowers of Sphæralcea angustifolia turn pale, dull pink, resembling somewhat a natural variety of the same. Any of your readers will doubtless obtain similar results with the flowers growing in their vicinity.

T. D. A. COCKERELL.

Las Cruces, New Mexico.

Painting Iron Work.

In a recent communication to the American Society of Civil Engineers, Mr. E. Gerber gives the results of a careful investigation into the present state of a number of bridges which had been painted with one of several classes of paint. In all cases rust was found to a greater or less extent, occurring always in spots in the center of clean metal. Most of this, however, was thin, and was as bad in new structures as in old. It was, however, found that the iron oxide paints adhered more firmly to the metal than the lead paints, only one case being found in which the latter adhered well and was tough. It is, however, suggested that much of this brittleness was due to adulteration of the oil by turpentine, benzine, or other petroleum products. There is more likelihood of such adulteration with lead paints than with iron, as they are more difficult to spread, and there is thus more temptation to dilute the oil. In some cases bridges coated with iron oxide eleven or twelve years ago were still in good condition, without having been repainted. Only two of the bridges examined had been painted with carbon or asphaltum paints, but the condition of things in these two cases was found to be not altogether satisfactory, as in neither case was the coating tough and adherent. The metal had, however, been protected by them. Mr. Gerber considers that too little attention has, in the past, been paid to thoroughly cleaning the metal before the first coat of paint is applied. Most of the rust spots found had apparently been there from the outset, and had done no harm so long as not too far advanced. The best plan of securing clean surfaces, in Mr. Gerber's opinion, would be to coat the metal with linseed oil as it left the rolls.

© 1895 SCIENTIFIC AMERICAN, INC.

TURTLES IN THE ZOOLOGICAL GARDEN AT HAMBURG.

When the keeper goes early in the morning to the large new turtle cage of the reptile gallery of the Zoological Garden at Hamburg with a basket filled with green vegetables, when he fills the long crib, which, with its crossbars, resembles a cattle rack, then there is life and movement among the amphibians. Some remain quiet even then, with their heads drawn in, perhaps enjoying a sweet morning nap, and others crawl slowly along, paying little attention to their surroundings. One would scarcely imagine that these creatures would so quickly notice the presence of the keeper with the food. One after another hastens to the rack, but a few, like the immense sea turtle, with the fin-like front legs, turn in disgust from the plant food, and the long-tailed alligator turtle, a real beast of prey, simply watches the others at their food. It need scarcely be explained that later meat and fish will be provided for them.

There are now 102 turtles in the Hamburg Garden, which represent 32 different species.—Illustrirte Zeitung.

The Size of the Solar System.

BY J. E. GORE, F.R.A.S.

As my readers are aware, the solar system consists of a number of planets revolving round the sun as a center, and of subordinate systems of satellites revolving round the planets, or at least round some of them. Our own earth is one of these planets, the third in order of distance from the central luminary, which forms the common source of light and heat to all the members of the system. In addition to the planets and satellites, there are also some comets which form permanent members of the solar system. Some of these comets revolve round the sun in very elongated orbits, while the planets revolve in nearly circular orbits. A consideration of the absolute size of this planetary system and its relative size compared with that of the universe of stars, or at least the universe visible to us, may prove of interest to the general reader.

To determine the size of the solar system, it is, of course, necessary, in the first place, to ascertain the dimensions of the planetary orbits with reference to some standard, or unit of measurement, as it is termed. The unit of measurement adopted by astronomers is the sun's distance from the earth. As the earth is the third planet in order of distance from the sun, this distance is, of course, an arbitrary unit. We might take the mean distance of Mercury from the sun as the unit, but as we refer all our measurements to terrestrial standards, and the diameter of the earth is used in the measurement of the sun's distance, it is found more convenient to take the sun's distance from the earth as the standard of measurement for the solar system and the distance of the stars.

The relative distances of the planets from the sun have been determined by astronomical observations, and are represented approximately by the following figures, the earth's mean distance from the sun being taken as unity: Mercury, 0·387; Venus, 0·723; the earth, 1·0; Mars, 1·523; the minor planets, 2·08 to 4·262; Jupiter, 5·203; Saturn, 9·538; Uranus, 19·183; and Neptune, 30·055; or, taking the earth's mean distance from the sun as 1,000, the distance of Mercury will be represented by 387; Venus, 723; Mars, 1,523; the minor planets, 2,080 to 4,262; Jupiter, 5,203; Saturn, 9,538; Uranus, 19,183; and Neptune, 30,055. These are the mean or average distances, the orbits not being exact circles but ellipses of various eccentricities, that of Mercury—among the large planets—being the most eccentric and that of Venus the least so. Among the minor planets the eccentricities vary from 0; or a perfect circle, to 0·44, the value found for a small planet discovered by M. Wolf in November, 1894.

The first scientific attempt to determine the sun's distance from the earth seems to have been made by Aristarchus, of Samos. His method was to note the exact time when the moon is exactly half full, and then to measure the apparent angle between the centers of the sun and moon. It is evident that when the moon is half full the earth and sun, as seen from the moon, must form a right angle with each other, and if we could then measure the angle between the sun and moon, as seen from the earth, all the angles of the right-angled triangle formed by the sun, moon and earth would be known, and we could deduce at once the relative distances of the sun and moon from the earth. This method is, of course, perfectly correct in theory, but in practice it would be impossible, even with a telescope, to determine the moment when the moon is exactly half full, owing to the irregularities of its surface. Aristarchus had no accurate instruments, and no knowledge of modern trigonometry, but by means of a tedious geometrical method he concluded that the sun is nineteen times further from the earth than the moon. This result we now know to be far too small, the sun's distance from the earth being in reality about three hundred and eighty-eight times the moon's distance.

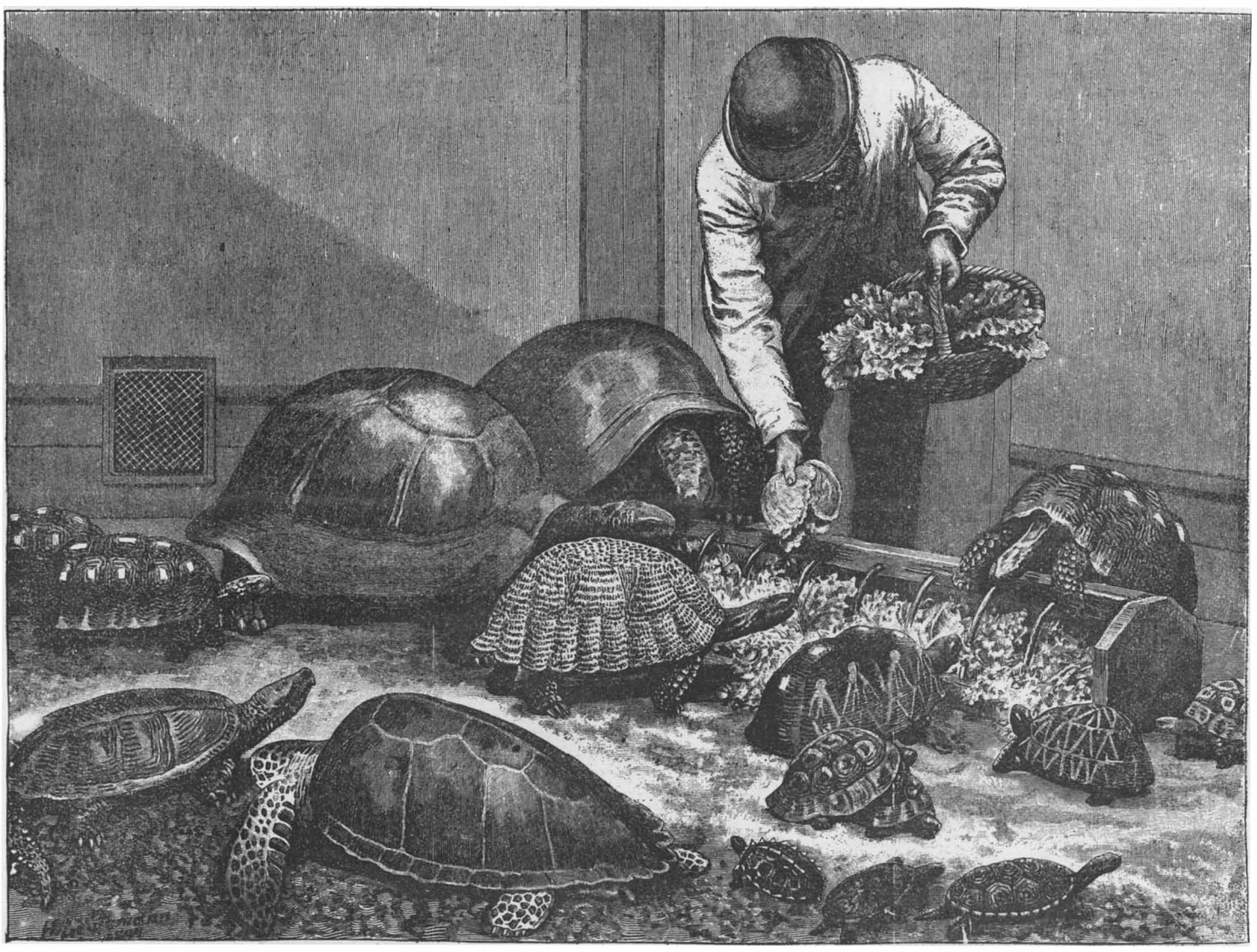
In modern times the sun's distance has been determined by various methods. The most recent results tend to show that the sun's parallax, as it is termed, cannot differ much from 8·81 seconds of arc. The solar parallax is the angle subtended at the sun by the earth's semi-diameter. A parallax of 8·81 seconds implies that the earth's mean distance from the sun is about 92,790,000 miles. Multiplying this number by the figures given above, we find that the mean distances of the planets from the sun are as follows, in round numbers: Mercury, 35,909,000 miles; Venus, 67,087,000; Mars, 141,384,000; the minor planets, 193,000,000 to 395,470,000 miles; Jupiter, 482,786,000; Saturn, 885,105,000; Uranus, 1,779,990,000; and Neptune, 2,788,800,000. This makes the diameter of the solar system, so far as at present known, about 5,578 millions of miles. Across this vast space light, traveling at the rate of 186,300 miles per second would take eight hours nineteen minutes to pass.

But vast as this diameter really is, compared with the size of our earth, or even with the distance of the moon, it is very small indeed when compared with the distance of even the nearest fixed star, from which light takes over four years to reach us. The most reliable measures of the distance of Alpha Centauri, the nearest of the fixed stars, places it at 275,000 times the sun's distance from the earth, or about 9,150 times the distance of Neptune from the sun. If we represent the diameter of Neptune's orbit by a circle of two inches in diameter, Alpha Centauri would lie at a distance of 762 feet, or 254 yards, from the center of the small circle. If we make the circle representing Neptune's orbit two feet in diameter, then Alpha Centauri would be distant from the center of this circle 9,150 feet, or about 1¾ miles.

As the volumes of spheres vary as the cubes of their diameters, we have the volume of the sphere which extends to Alpha Centauri 766,000 million times the volume of the sphere containing the whole solar system to the orbit of Neptune. If we represent the sphere containing the solar system by a grain of shot one-twentieth of an inch in diameter, the sphere which extends to Alpha Centauri would be represented by a globe 38 feet in diameter.

It will thus be seen what a relatively small portion of space the solar system occupies compared with the sphere which extends to even the nearest fixed star. But this latter sphere, vast as this is, is again relatively small compared with the size of the sphere which contains the great majority of the visible stars. Alpha Centauri is an exceptionally near star. Most of the stars are at least ten times as far away, and probably many a hundred times further off. A sphere with a radius 100 times greater than the distance of Alpha Centauri would have a million times the volume, and therefore 766,000 billion times the volume of the sphere which contains the whole solar system!

From these facts it will be seen that enormously large as the solar system absolutely is, compared with the size of our own earth, it is, compared with the size of the visible universe, merely as a drop in the ocean.—Knowledge.



TURTLES IN THE ZOOLOGICAL GARDEN AT HAMBURG.

THE largest landed estate is that of the Czar Nicholas of Russia, 100,000,000 acres.

© 1895 SCIENTIFIC AMERICAN, INC.

How Goodyear Became a Rubber Inventor.

The ruinous failure of the earliest American rubber manufacturers, says a writer in the Boston Commercial Bulletin, arose from the fact that they began their costly operations in ignorance of the qualities of the material which they had to deal with. No one had discovered any process by which India rubber once dissolved could be restored to its original constituency, and the importance of this item was overlooked until many men had been ruined.

It was in the year 1820, the same writer continues, that a pair of India rubber shoes was seen for the first time in the United States. They were covered with gilding, and resembled in shape the shoes of a Chinaman. They were handed about in Boston only as a curiosity. Two or three years after, a ship from South America brought to Boston 500 pairs of shoes, thick, heavy, and ill-shaped, which sold so readily as to invite further importations. The business increased until the annual importation reached half a million pairs, and India rubber shoes had become an article of general use.

The manner in which these shoes were made by the natives of South America was frequently described in the newspapers, and seemed to present no difficulty. They were made much as farmers' wives made candles. The sap being collected from the trees, clay lasts were dipped into the liquid twenty or thirty times, each layer being smoked a little. The shoes were then hung up to harden for a few days; after which the clay was removed, and the shoes were stored for some months to harden them still more.

Nothing was more natural than to suppose that Yankees could do this as well as Indians, if not far better. The raw India rubber could then be bought in Boston for five cents a pound, and a pair of shoes made of it brought from $3 to $5. Surely here was a promising basis for a new branch of manufacture in New England. It happened, too, in 1830, that vast quantities of the raw gum reached the United States. It came covered with hides, in masses, of which no use could be made in America; and it remained unsold, or was sent to Europe.

Patent leather suggested the first American attempt to turn India rubber to account. Mr. E. M. Chaffee, foreman of a Boston patent leather factory, conceived the idea, in 1830, of spreading India rubber upon cloth, hoping to produce an article which should possess the good qualities of patent leather, with the additional one of being waterproof. In the deepest secrecy he experimented for several months. By dissolving a pound of India rubber in three quarts of spirits of turpentine, and adding lampblack enough to give it the desired color, he produced a composition which he supposed would perfectly answer the purpose.

He invented a machine for spreading it, and made some specimens of cloth, which had every appearance of being a very useful article. The surface, after being dried in the sun, was firm and smooth; and Mr. Chaffee supposed, and his friends agreed with him, that he had made an invention of the utmost value. At this point he invited a few solid men of Roxbury, Mass., to look at his specimens and listen to his statements. He convinced them. The result of the conference was the Roxbury India Rubber Company, incorporated in February, 1833, with a capital of $30,000.

The progress of this company was amazing. Within a year its capital was increased to $240,000. Before another year had expired, this was increased to $300,000; and in the year following, to $400,000. The company manufactured the cloth invented by Mr. Chaffee, and many articles made of that cloth, such as coats, caps, wagon curtains and coverings. Shoes made without fiber were soon introduced. Nothing could be better than the appearance of these articles when they were new. They were in the highest favor, and were sold more rapidly than the company could manufacture them.

The astonishing prosperity of the Roxbury company had its natural effect in calling into existence similar establishments in other towns. Manufactories were started at Boston, Framingham, Salem, Lynn, Chelsea, Troy, and Staten Island with capitals ranging from $100,000 to $500,000; and all of them appeared to prosper. There was an India rubber mania in those years similar to that of petroleum in 1864. Not to invest in India rubber stock was regarded by some shrewd men as indicative of inferior business talents and general dullness of comprehension.

The exterior facts were certainly well calculated to lure even the most wary. Here was material worth only a few cents a pound, out of which shoes were quickly made, which brought $2 a pair! It was a plain case. Besides, there were the India rubber companies, all working to their extreme capacity, and selling all they could make. Such were the conditions of the trade when Charles Goodyear visited the New York office of the Roxbury Rubber Company to suggest some improvements in inflating a life preserver manufactured by the company. To his surprise the agent took him into his confidence and explained that the prosperity of all the India rubber companies in the United States was only apparent; that they needed an ingenious inventor to save them all from ruin.

The Roxbury company had manufactured vast quantities of shoes and fabrics in the cool months of 1833 and 1834, which had readily been sold at high prices; but, during the following summer, the greater part of them had melted. Twenty thousand dollars' worth had been returned, reduced to the consistency of common gum, and emitting an odor so offensive that they had been obliged to bury it. New ingredients had been employed, new machinery applied, but still the articles would dissolve. In some cases, shoes had borne the heat of one summer and melted the next. The wagon covers became sticky in the sun and rigid in the cold.

The directors were at their wits' end; since it required two years to test a new process, and meanwhile they knew not whether the articles made by it were valuable or worthless. If they stopped manufacturing, that was certain ruin. If they went on, they might find the product of a whole winter dissolving on their hands. The capital of the company was already so far exhausted that, unless the true method were speedily discovered, it would be compelled to wind up its affairs.

The agent urged Mr. Goodyear not to waste time upon minor improvements, but to direct all his efforts to finding out the secret of successfully working the material itself. The company could not buy his improved inflator; but let them learn how to make an India rubber shoe that would stand the summer's heat, and there was scarcely any price which it would not gladly give for the secret.

The worst apprehensions of the directors of this company were realized. The public soon became tired of buying India rubber shoes that could only be saved during the summer by putting them into a refrigerator. In the third year of the mania, India rubber stock began to decline, and Roxbury itself finally fell to $2.50. Before the close of 1836, all the companies had ceased to exist, their fall involving many hundreds of families in heavy loss. The clumsy, shapeless shoes from South America were the only ones which the people would buy. It was generally supposed that the secret of their resisting heat was that they were smoked with the leaves of a certain tree, peculiar to South America, and that nothing else in nature would answer the purpose.

The $2,000,000 lost by these companies had one result which has proved to be worth many times that sum: it led Charles Goodyear to undertake the investigation of India rubber. That chance conversation with the agent of the Roxbury company fixed his destiny.

RECENTLY PATENTED INVENTIONS.

Engineering.

WATER TUBE BOILER.—Frank Printz, New Orleans, La. This is an improvement in boilers having a steam drum supported on water legs which connect it with mud drums, and provides a duplicate construction and combination of pipe coils with valve attachments whereby a portion of the apparatus may be isolated, while its duplicate is left intact, to facilitate repairs, etc. The main portion of the generator proper is inclosed by a metal casing having a hinged top and sides to facilitate access thereto, and is preferably lined with asbestos and fire tile up to the height of the fire box.

Railway Appliances.

CAR COUPLING.—Andrew J. Clark, Madison Station, Miss. Upon the front of a coupling head at the forward end of a spring-pressed draw bar are hooks projecting from the top and bottom sides of draught hook bodies, there being a tripping dog above the coupling head block, and flexible connections between the hooks and tripping dog, and means for operating the connections from a car, the locomotive, or the ground. With this improvement the cars are coupled automatically as they come together, the coupling working equally well on a straight track or on curves, and whether the car tracks are of the same or different heights.

AIR BRAKE.—John M. Hurst, Salt Lake City, Utah. This invention provides for retaining the air in the brake cylinders while recharging the auxiliary reservoirs, and consists of a pressure-retaining valve, a pressure-retaining reservoir, a valve interposed between the triple valve and the retaining valve, and a retaining pipe connecting the train pipe with the interposed valve. Each car exhausts its own air, and the amount is shown by the gage on the engine, while the pressure in all the brake cylinders of the train is equalized and the air now lost in applying the brakes is saved.

CAR FENDER.—Alexander S. Williams, Long Island City, N. Y. This fender consists of rods or bars hinged together to form a lazy tongs structure adapted to be collapsed or distended, rollers adapted to travel on the rails being located on the lower portion of the fender. These fenders are designed to be placed at each end of a car, and when the car is placed in a shed the fenders fold up in small compartments beneath the dashboard.

SWITCH MECHANISM.—Sumter B. Battey, New York City. This is an improvement on a formerly patented invention of the same inventor, and provides a mechanism more especially designed for use on street railroads, and enabling the operator in charge of the car to readily set the switch according to the direction in which the car should travel.

Electrical.

ELECTRIC MOTOR.—Addison E. Boggs, Allegheny, and Fremont J. Cleaver, Beltzhoover, Pa. This is a motor especially adapted for direct connection with the machine to be driven or with line shafts or car axles, or for use in connection with gearing or pulleys and belts, for diminishing or increasing the speed. A field magnet is secured to one side of a wheel and an armature is mounted on the axle, while a commutator wheel is mounted on the boss of the armature and has an insulated rim upon which are placed commutator bars, an insulated ring being secured to the pole pieces of the field magnet. Inwardly extending studs secured to the insulated ring carry brushes, and metallic rings secured to the face of the insulated ring are connected with the studs.

TROLLEY AND TROLLEY POLE.—Wilbur L. Pepper, Philadelphia, Pa. According to this improvement a vertical pole is employed which permits the car to run with equal facility in both directions. an automatic device permitting the pole to yield vertically. according to the varying distance between the wire and car. The trolley wheel is held with an even pressure against the wire, making good contact during all the oscillations of the car and changes in the wire, while the good connections prevent excessive sparking.

Mechanical.

BAND AND SCROLL SAW ATTACHMENT.—Herman D. Hinternesch. Baltimore, Md. This attachment comprises a transversely tilting or rocking table with longitudinally movable guide devices to tilt the table in opposite directions, there being also back rests for the rear end of the timber being sawed, and the back rest and table having recessed and interlapping portions permitting the timber to be moved past the saw. The attachment may be conveniently applied to an ordinary band or scroll saw, to facilitate sawing hand rails, mouldings, etc., for circular or curved stairways, the apparatus being conveniently adjustable to saw to any given circle or curve, and any degree of pitch or rise.

COTTON GIN.—John B. Crowder, Talucah, Ala. This inventor has devised an attachment to an ordinary gin for removing dust, dirt, chaff or other trash from cotton as it comes from the saw and for breaking up bunches, curls or condensed portions of the cotton. It consists of a narrow ribbed or flanged concave beneath the gin brush, with open places adjacent to the ribs to permit a downward air draught.

WATER MOTOR.—Mifflin W. Baily, Pottstown, Pa. According to this invention, the outlet valve of a flume discharges the water into a vessel held on the upper end of an inclined hollow working lever forming a connection between the upper vessel and a second vessel on the lower end of the lever, both vessels having valves having connections with fixed points and adapted to open and close alternately. The motor is designed to utilize the water to the fullest advantage without any waste.

Miscellaneous.

BICYCLE COAT.—Ansel B. Falk, New York City. This invention provides a brace for the inside of the back of the coat, designed to prevent the wearer from stooping forward as much as bicycle riders often do, the brace being virtually an integral portion of the coat. It consists of a centrally located pad of elastic material with diverging straps emanating from the ends and top of the pad and attached to the garment at the side back portions and at the collar portion.

PRESCRIPTION FILE.—Albert M. Stanley, Springfield, Col. This improvement comprises a casing in which are reels to receive the filing tapes, a table being located adjacent to an opening in the casing and rollers journaled at the ends of the table, while a tape secured to the reels passes over the rollers and table. Any prescription filed may be brought to view and as conveniently read as though it were not upon file, and files stored away may be as conveniently read as those in the file casing.

WHEEL.—Chilion T. Pelton, Riverside, Cal. This wheel is more especially designed for reapers and mowers, preventing dust and sand from being carried upward to enter the journal boxes or clog up parts of the machine. It has a flat rim with flanges on each side, cover plates on each side of the rim having latches engaging the flanges, the latches having handles outside the cover plates. These cover plates may be fitted to any form of wheel.

THILL SUPPORT.—Charles A. Rotthouse. Brandywine Hundred, Del. This device consists of a spring rod bent at its middle to form loops receiving bolts for attaching it to the under side of a thill, the remaining portions of the rod being bent to form two spring coils and bearing portions engaging a bolt of the clip on the axle. The device is designed to securely hold the shaft in raised position, while yielding when the shaft is to be swung down.

HEEL PLATE.—Percy J. Van Valkenburg, New York City. On the under side of the shoe, according to this improvement, are two eyelets, one with a closed and the other with an open eye, the eyelets having split shanks which are passed through the heel and clinched on the inner side, in connection with which is used a plate having two ears, each capable of completely removable connection with the eyelets. The plate may be applied where the wear is greatest, and may be readily reversed as it is worn down on one side.

GATE.—Franklin R. Winters, Tulsa, Indian Territory. This is primarily a farm gate, of the lifting and swinging variety, and may be conveniently opened and closed by one on foot or in a vehicle. A rock shaft has a double crank hinged to the gate, and a duplex rock arm on the shaft has a locking limb projected between the duplex limbs, while a bracket plate with triple notched flange is adapted to receive the locking limb in either of the notches of its flange. The working parts are strong, inexpensive, and not liable to derangement or need of frequent repair.

GATE.—James Simpson, Veedersburg, Ind. This is a gate which may be opened or closed from either side by drawing down on a latch cable or on a lever cable, and it may be opened toward or away from the person operating it. A rearwardly extending lever fulcrumed on the swing post has a sliding connection with the gate, there being a cable connected with the rear end of the lever, and a second cable also so connected but having a bearing at the opposite side of the lever, the cables thus exerting force in opposite directions on the lever.

INTERMITTENT ROTARY MOTION.—Georg F. Haldkjar, Copenhagen, Denmark. A mechanism for producing intermittent abrupt movements or "jerks," such as may afford an effective display of figures for advertising purposes, etc., has been devised by this inventor. It comprises an arm mounted to swing and provided with projections, while a disk is mounted to rotate about an axis eccentric to the swinging arm, the disk having alternating notches and solid portions moving across the path of travel of the projections of the arm.

COW MILKING MACHINES.—Jerry E. Harvey and Joseph H. Hoover, Hubbard, Iowa. These inventors have devised an apparatus for maintaining and regulating vacuums in these machines, by which a practically uniform expansion and tension of the air may be maintained in the milk receiver and its connections during the entire milking operation, irrespective of the quantity of milk drawn into the receiver. The apparatus comprises means for automatically expanding the air exhaust chamber as the air tension varies with the inflow of milk, there being a tubular connection between the chamber and the receiver or teat cups.

WARDROBE.—Robert H. Rodgers, Nashua, N. H. This is a construction especially adapted to be stored under a bed in houses deficient in closet room, and has a shallow, box-like body, with rollers on the bottom and handles at the front, while a cover slides on its top, cleats in the under side of the cover fitting in grooves in the inner sides of the body.

PROTECTIVE PAPER FOR CHECKS, ETC.—Herman Remke. Newport, Ky. This invention provides for treating the paper after it has been written upon with certain solutions to change its ink-receiving qualities. Two solutions are successively applied, the first being composed of three parts of some essential oil, preferably oil of lavender, sixteen parts of tincture of saffron and twenty-one parts of alcohol, and the second being a concentrated alkaline solution, preferably sodium carbonate in water. The quality of the paper is thus permanently changed, so that it will not readily take ink and the writing is not destroyed or blurred. The solutions are applied with a felt pad or stamp.

STRETCHER AND AMMUNITION CARRIER.—Frederic Remington, New Rochelle, N. Y. A wheel is loosely mounted upon an axle, according to this improvement, and telescopic cushioned arms are pivoted on the axle at opposite sides of the wheel, each arm hav-

© 1895 SCIENTIFIC AMERICAN, INC.

ing a socket and a locking device, the sockets receiving a stretcher or an ammunition frame. The device is very light and may be folded to occupy but small space.

WASHBOARD.—Lewis Peterson, Madrid, Iowa. A hydraulic attachment for a washboard is provided by this invention, adapted to throw a stream of water from the tub on the clothes being rubbed. The upper end of the board in use is supported by cylindric sections which form substantially a pump by which the water is lifted from the tub and discharged over the clothes as the operator exerts a downward pressure in rubbing the clothes.

FOOT BALL.—Alexander Nisbet, New York City. This ball is made with a concealed lace, preventing abrasion of the skin of the player and insuring a truer rebound of the ball, and the leather cover is practically in two pieces only, dispensing with the four connected seams usually found at the end of the ball. A valve is also provided of such character and so placed that the ball need not be unlaced to inflate it.

TAG AND TAG DRIVER.—William L. Millar, Charleston, S. C. This is a device for use with bales and packages as an improvement upon ordinary metallic tags and drivers. The shank of the tag has marginal flanges with a roughened surface, there being an anchor in the shank, and the tag driver, by which the tag is forced into the bale, has a handle at one end, while its opposite end is widened, terminating in a point. The driver is easily detached from the tag and removed from the bale.

CONTINUOUS CHARCOAL KILN.—Erik J. Ljungberg, Falun, Sweden. This kiln has several compartments in which the wood is ignited, the combustion gases being conveyed from one compartment to the other. The connection of the compartments is effected through valves closed by a sheet of water or water seals, the rising or falling of the surface of the water connecting or disconnecting the compartments. The process of carbonization is regulated by raising or lowering the water surfaces, whereby the area for the passage of inflammable gases is controlled.

Designs.

EWER.—Robert L. Johnson, Hanley, England. The mouth of this ewer has a convoluted edge in which scroll figures intersect each other, and the base has also a convoluted appearance matching the margin of the mouth.

CHRISTMAS TREE ORNAMENT.—William E. Wagner, Gordon, Pa. Within a circular tufted frame, according to this design, is held a spherical figure with upper and lower projections, forming an ornament for suspension from Christmas trees, etc.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

THE HERSCHELS AND MODERN ASTRONOMY. By Agnes M. Clerke. New York: Macmillan & Company. 1895. Pp. 324. Portrait. Price $1.25.

This work is a volume of the Century Science series, which is edited by Sir Henry E. Roscoe. It is interesting to note that there are in preparation the lives of Michael Faraday, Clerk Maxwell, Sir Charles Lyell, Humphry Davy, Pasteur, Charles Darwin and Herman von Helmholtz. There are already several works on Herschel, but the present work contains the results obtained from a study of the correspondence of Sir William Rowan Hamilton and Herschel, the author having been favored by the late Miss Herschel with the perusal of a considerable number of the manuscript letters of Sir John Herschel as well as Sir William's. There are chapters on the "King's Astronomer," the "Explorer of the Heavens," "Herschel's Special Investigations," "Influence of Herschel's Career," "Caroline Herschel," "Writings and Investigations."

BULLETIN OF THE UNITED STATES FISH COMMISSION. Vol. XIV, for 1894. Washington: Government Printing Office. 1895. Pp. 496. 8vo. 25 plates, illustrated.

This volume, like the preceding Bulletins, consists of monographs, and, as usual, contains some important papers, as for example the Salmon Fisheries of the Columbia River Basin, by the late Marshall MacDonald, United States Commissioner of Fish and Fisheries.

INSECT LIFE: DEVOTED TO THE ECONOMY AND LIFE HABITS OF INSECTS, ESPECIALLY IN THEIR RELATIONS TO AGRICULTURE. Edited by L. O. Howard, Entomologist United States Department of Agriculture. Vol. VII, No. 5. Washington. 1895. 8vo pamphlet.

This journal is published by authority of the Secretary of Agriculture, and is deserving of more attention than it has received. The present number gives the results of some remarkable experiments and observations. The division of entomology of the Department of Agriculture consists of one entomologist, three assistant entomologists, four investigators, one artist and a special agent in apiculture.

UNIVERSITY CORRESPONDENCE COLLEGE. The Calendar 1894-1895. London, September 1, 1894. Pp. 69. 16mo.

REPORT ON THE TOTAL ECLIPSE OF THE SUN OBSERVED AT MINA BRONCES, CHILE, ON APRIL 16, 1893. By J. M. Schaeberle, Astronomer in the Lick Observatory. Sacramento. 1895. Pp. 126. 8vo. 10 plates.

This book is printed by the authority of the regents of the University of California and forms volume No. 4 of the contributions from the Lick Observatory. The expedition to observe the total eclipse of the sun of April 16, 1893, was sent from the Observatory at the cost of Mrs. Phebe Hearst, a friend of the University of California. The book gives full details of the observations made by the astronomers.

ELECTRICITY FOR STUDENTS. By Edward Trevert. Lynn, Mass.: Bubier Publishing Company. 1895. Pp. 128. 16mo. 38 illustrations. Price $1.

The object of this little book is to explain briefly the theory and practice of some of the commoner applications of electricity. It is intended only as a popular treatise dealing with the practical applications of the science.

PRINCIPLES AND PRACTICE OF AGRICULTURAL ANALYSIS. A manual for the estimation of soils, fertilizers, and agricultural products, for the use of analysts, teachers, and students of agricultural chemistry. Vol. II. Fertilizers. By Harvey W. Wiley. Easton, Pa.: Chemical Publishing Company. 1895. Pp. 332. 8vo. 17 illustrations. Price $2.

A few weeks ago we reviewed Dr. Wiley's "Soils," the companion volume. The present work takes up the subject of fertilizers. Certainly no one could be more competent to deal with the analysis of fertilizers than the Chemist of the United States Department of Agriculture. In the present volume the general principles of fertilizer manufacture and application have been presented in so far as they seemed to throw light on the rational method of examination and analysis. The standard methods of analysis in this and other countries have been presented with sufficient fullness for the guidance of the skilled worker and the information of the student. To those who make use of a book only for routine work or for preparation for an examination, this volume will be found to have little attraction. This fact, however, will not be a cause of regret to the author, whose purpose has been avowedly to present to the busy worker and student a broad view of a great subject which each one does not have the time to search out for himself. The author's list of authorities cited is very full and the type and presswork are excellent.

☞Any of the above books may be purchased through this office. Send for new book catalogue just published. MUNN & Co., 361 Broadway, New York.

SCIENTIFIC AMERICAN BUILDING EDITION.

OCTOBER, 1895.—(No. 120.)

TABLE OF CONTENTS.

1. Plate in colors of a handsome cottage at Rochelle Park, New Rochelle, N. Y. Two perspective elevations and floor plans. Cost $9,000 complete. Mr. H. S. Rapelye, architect, Mount Vernon, N. Y. A pleasing design for a suburban residence.
2. Cottage at Kennebunkport, Me., recently erected for B. S. Thompson, Esq. Perspective elevation and floor plans. A very attractive residence in the English style of architecture. Mr. Henry P. Clark, Boston, architect.
3. A cottage at Flatbush, N. Y., recently erected at a cost of $4,000. Perspective elevation and floor plans. John J. Petit, architect, Brooklyn, N. Y. An attractive design.
4. An all shingled cottage at Mount Vernon, N. Y. Perspective elevation and floor plans. A neat design in the Colonial style. Mr. Louis H. Lucas, New York City, architect.
5. A suburban cottage at Flatbush, L. I, recently erected at a cost of $8,000 complete. Perspective elevation and floor plans. Messrs. Rowe & Baker, New York City, architects. An attractive design in the Colonial style.
6. A dwelling at Glenwood, Yonkers, N. Y. Perspective elevation and floor plans. Messrs. D. & J. Jardine, architects, New York City. A most unique design.
7. Three perspective views and floor plans of a residence at New Rochelle, N. Y. Architects, Messrs. Stephenson & Greene, New York City. A well treated design.
8. A Colonial residence at Mountain Station, N. J. Two perspective elevations and floor plans. Mr. H. C. Pelton, architect, New York City.
9. A house at New Haven, Conn., recently erected at a cost of $3,500 complete. Two perspective elevations and floor plans. A modern economical cottage design. Architects, Messrs. Stilson & Brown, New Haven, Conn.
10. A Colonial cottage at Bronxville, N. Y., recently completed at a cost of $4,600. Perspective elevation and floor plan. Mr. W. H. Rahman, architect, New York City.
11. Miscellaneous Contents: Buff brick.—Tower tanks for water works, illustrated.—An old Baltimore firm.—Compo-Board instead of plaster—Translucent fabric, a substitute for glass.—Ventilation and heating of school buildings. — Ornamental glass.—A light and strong lifting jack, illustrated. —An improved circular saw, illustrated.—An improved wood working machine, illustrated.—Stamped steel ceilings, side walls and wainscoting, illustrated.—Spring hinges.—Mallory's standard shutter worker and fly screen.—An improved nail set, illustrated.

The Scientific American Building Edition is issued monthly. $2.50 a year. Single copies, 25 cents. Thirty-two large quarto pages, forming a large and splendid MAGAZINE OF ARCHITECTURE, richly adorned with elegant plates and fine engravings, illustrating the most interesting examples of Modern Architectural Construction and allied subjects.

The Fullness, Richness, Cheapness, and Convenience of this work have won for it the LARGEST CIRCULATION of any Architectural Publication in the world. Sold by all newsdealers. MUNN & CO., PUBLISHERS, 361 Broadway, New York.

Business and Personal.

The charge for insertion under this head is One Dollar a line for each insertion: about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

"U. S." metal polish. Indianapolis. Samples free.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Handle & Spoke Mchy. Ober Lathe Co., Chagrin Falls, O.

Screw machines, milling machines, and drill presses. The Garvin Mach. Co., Laight and Canal Sts., New York.

Use the Hough Security Cash Recorder. Entirely different from a Cash Register. Hough Cash Recorder Co., South Butler, N. Y.

Pipe Joint described on page 245. Estimates wanted for manufacturing in all patterns and sizes. Michael Sexton, 1112 Third Ave., New York.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4; Munn & Co., publishers, 361 Broadway, N. Y.

Large machine shop, having water power, all new and latest tools, foundry, pattern shop, draughtsmen, mechanical engineers, skilled workmen, etc., will construct special or patented machinery promptly, satisfactorily, and reasonable. Address N. Y. P. O. box 1,965.

A capable mechanical engineer wishes position as manager of some electric street railway interest. Is familiar with every detail of construction and can design and erect new work. Good references. Address Engineer, care of Scientific American office, New York.

☞Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(6634) C. M., Bala, Can., asks for a receipt for tempering drills for granite rock. A. Drills for granite, for best effect, should have their cutting edge at an angle of 75°, and if single blade, should have the point a little one side of the center. By this shape the side thrust of the drill gives it a clearance and prevents sticking. Careful and slow heating to as low a heat as will allow the particular brand of steel to harden is desirable. Harden in salt water; one quart of salt to a pail of water. Some smiths add a couple of ounces of yellow prussiate of potash to the pail of salt water. The principal aim should be to work the steel at a low red heat, avoid burning the corners and not draw the temper.

(6635) J. M. R. asks: Will a bicycle run easier and cut the bearings less with oil on bearings, or without oil, or with plumbago on bearings instead of oil? A. The best lubricant for bicycles is cylinder or dynamo oil of the trade, mixed with 10 per cent of finely ground graphite for the bearings. This mixture should flow from the spout of the oil cup. For the chain, graphite should be made into a soft paste with the above oil. We do not recommend dry bearings or dry chain.

(6636) D. W. H. asks which side of rubber belting should be run next to the pulley—the face side or the lap side. A. The face side of a rubber belt should be next the pulley; it gives a more perfect contact and is less liable to slip and wear at the lap seam.

(6637) C. H. says: I wish to etch a design on a pair of skates. Will you please tell me the quickest and easiest way of doing it? A. For etching on cutlery a ground wax is required, composed of equal parts asphaltum, Burgundy pitch and beeswax, melted together and thoroughly incorporated. In applying it, use a dabber, or ball of cotton covered with silk. Warm the piece of cutlery so that a stick of the wax will readily melt by touching. Smear a small quantity of the wax on the blade or articles, and dab it evenly all over the surface. When cold, scratch the required design or name on the surface and touch the parts with acid (nitric acid 1 part, water 4 to 6 parts), using a camel's hair pencil to cover the surface and bring the acid into contact with all the lines. In a few minutes the biting is done. Dip in hot water to wash off the acid, and the surface may be cleaned by wiping with benzine. Another way is to make a varnish of asphalt and turpentine, with a few drops of linseed oil to make it tacky. Have a rubber stamp made of the required design, with a border, so as to stop off around the design. Stamp the goods, and with some of the varnish thinned down with turpentine and a brush stop off the surrounding parts; or surround the design with a small rim of beeswax, and apply the acid as above.

(6638) H. B. J. says: Will you kindly tell me what preparation is used in stiffening felt hats? A. Mix 18 pounds of shellac with 1½ pounds carbonate of potash and 5½ gallons of water. Put in a kettle and boil gradually until the shellac is dissolved, when the liquid will be as clear as water. When cold dip the hats, and when nearly dry dip in a weak solution of acetic or sulphuric acid, in order to neutralize the potash and cause the shellac to set.

(6639) R. J. asks: What two metals will slide the easiest, one upon the other? Say a bar one inch wide to slide across another bar of the same width, the weight to be one hundred pounds. A. With dry surfaces the hardest metals with smooth or polished surfaces have the least sliding friction when two surfaces of the same kind of metal are rubbed together. Hardened steel surfaces have the least friction of the metals most convenient for general use. Antimony on hard steel has a low per cent. of friction, as has also nickel upon nickel or nickel upon hard steel.

(6640) G. R. R. asks: Will you inform me through your paper the year in which the first railroad sent out a train, and whether the B. & O. was absolutely the first? A. The first trial of a locomotive in the United States was in August, 1829, with the Stourbridge Lion, built in England for the Delaware & Hudson Canal Company. It was tried alone without cars, Horatio Allen being the engineer. It was set aside and never used again. Peter Cooper built the first locomotive that drew a train of passenger cars in the United States. It was built during the year 1829 and used with a train of two cars on August 28, 1830, on the B. & O. Railroad. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 371, for a History of Early American Railroads and Locomotives.

(6641) B. H. C. asks how to prepare sheepskins for mats A. Make a strong lather with hot water and let it stand till cold; wash the skin in it, carefully squeezing out all the dirt from the wool; wash it in cold water till all the soap is taken out. Dissolve 1 lb. each of salt and alum in two galls. of hot water, and put the skin into a tub sufficient to cover it; let it soak for twelve hours, and hang it over a pole to drain. When well drained stretch it carefully on a board to dry, and stretch several times while drying. Before it is quite dry, sprinkle on the flesh side 1 oz. each of finely pulverized alum and saltpeter, rubbing it in well. Try if the wool be firm on the skin; if not, let it remain a day or two, then rub again with alum; fold the flesh sides together and hang in the shade for two or three days, turning them over each day till quite dry. Scrape the flesh side with a blunt knife and rub it with pumice or rotten stone.

TO INVENTORS.

An experience of nearly fifty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

October 8, 1895,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Acids, making aromatic oxycarbon, L. Lederer... 547,611
Addressing machine, D. Wrigley... 547,532
Air compressor, hydraulic, J. J. Keenan... 547,519
Air engine for animal shears, compressed, J. Fletcher et al... 547,718
Air motor, W. Cawbern... 547,661
Album, A. Gruner... 547,428
Animal trap, T. Curley... 547,539
Axle box, roller bearing, P. J. Tunny... 547,365
Axle cutting machine, M. Engeln... 547,425
Bank safety device, H. W. Wait... 547,702
Barbed fabric, E. F. Madden... 547,442
Bearing, ball, W. I. Grubb... 547,638
Bearing, shaft, E. J. Armstrong... 547,654
Bed attachment, invalid, G. H. Gove... 547,607
Bed bottom, spring, W. E. Frank... 547,604
Bed couch, N. Webster... 547,529
Bell, bicycle, N. T. Mills... 547,443
Bell, door, E. C. Tibbals... 547,694
Bicycle, electric, H. W. Libbey... 547,441
Bicycle frame, H. & F. Mesinger... 547,734
Bicycle pedal, W. I. Grubb... 547,639
Bicycle stand, A. H. Boerum... 547,412
Bicycle wheel, wooden rim, G. W. Marbie... 547,732
Blanket fastening attachment, J. H. Dailey... 547,514
Boiler. See Water heating boiler. Water tube boiler.
Boilers, device for feeding depurgative liquid to, E. S. Hoyt... 547,436
Book, account, W. E. Gibbs... 547,543
Book, account, Hudson & Gibbs... 547,579
Book holder, C. P. Harris... 547,720
Book signature perforator, J. W. Clark... 547,420
Boring machine, W. W. Black... 547 658
Bottle holder, W. H. Courtenay... 547,713
Bottle stopper, O. H. R. Nienaber... 547,497
Brake. See Car brake. Differential brake.
Brake beam, S. H. Terry... 547,693
Brake block, Schilly & Cave... 547,685
Brake mechanism, fluid pressure automatic, J. J. Finney... 547,484
Brake slack adjuster, F. Robinson... 547,649
Brick, building, W. M. Hazel... 547,721
Brick cleaning machine, W. B. Turner... 547,746
Bridle bit, Russell & Hawkey... 547,589
Bung for barrels, etc., A. E. McKechnie... 547,735
Burner. See Hydrocarbon burner.
Butter or cheese cutter, T. J. Thomas... 547,463
Button, J. W. Beaumont... 547,410
Button making machine, T. F. Morrissey... 547,561
Can guard, A. L. Baron... 547,656
Can nozzle, C. Bramberg... 547,574
Cane weaving machine, Powers & Telfair... 547,449
Car brake, W. S. Adams... 547,533
Car coupling, J. H. Hagan et al... 547,429
Car coupling, H. E. Moomaw... 547,494, 547,495
Car coupling, C. H. Taylor... 547,462
Car coupling, F. Waldman... 547,652
Car coupling, T. H. Walsh... 547,747
Car draft apparatus, J. A. Brill... 547,477
Car fender, F. B. Crooker... 547,628
Car fender, J. W. Hentz... 547,578
Car fender, J. W. McKinnon... 547,522
Car fender, Sherwood & Parsons... 547,566
Car fender, street, R. A. Breul... 547,707
Car lighting apparatus, electric, W. Biddle... 547,536
Car lighting, electric, Biddle & Dey... 547,537
Car seat, E. M. Bushnell... 547,749
Car wheel safety guard, Libbing & Harris... 547,728
Card table, C. Saunders... 547,619
Cartridge packet, J. P. Lee... 547,582
Case. See Medicine case.
Case for books, papers, etc., A. W. Baxter... 547,535
Casting dovetails on stove bottoms, moulder's pattern for, A. K. Beckwith... 547,475
Cellulose, sorting drum for removing knots from dissolved, L. Engelmayer... 547,600
Centering or pivoting drill, automatic, M. Leist... 547,726
Chair. See perambulating chair.
Chalk holder for marking sticks, F. H. Getchell... 547,542
Chamfering and crozing machine, H. Boyer... 547,416
Cheese box trimmer, R. A. Oakley... 547,498
Chuck, P. F. Krug... 547,644
Chuck, lathe, P. F. Krug... 547,643
Cigar fillers, device for shaping, J. Dela Mar... 547,555
Cigar rolling table and wrapper cutter, combined, J. Dela Mar... 547,556, 547,557
Cigarette machine, D. Perez y Bunol... 547,709
Clip for holding papers, samples, etc., O. Lehmann... 547,647
Clothes dampening machine, A. S. Simons... 547,689
Clothes drier, J. Kettlewell... 547,489
Clothes line hanger, R. S. & F. W. Subers... 547,508

© 1895 SCIENTIFIC AMERICAN, INC.

Clothes wringer, A. W. Walker 547,569
Coal from one ship to another, device for transferring, F. Ridgway 547,453
Cock and support for train pipe couplings, angle, E. G. Shortt 547,688
Cock, ball, C. E. Senna 547,620
Concentrator, J. Jacobs 547,640
Cooker and boiler, food, G. Schneider 547,686
Cooker, steam canning, S. D. Smith 547,590
Cork puller, E. E. Brown 547,478
Cotton cleaning appratus, S. D. Murray 547,671
Cotton, machine for handling, cleaning, and distributing seed, F. C. Gammons 547,516
Coupling. See Car coupling. Pipe coupling. Thill coupling.
Coupling, N. Tverskoy 547,650
Crape, shipping, J. H. Greenstreet 547,486
Cultivator, J. Boyd 547,624
Cultivator, Lenox & Underwood 547,727
Cultivator, disk plow, C. E. Swanson 547,744
Cultivator, wheel, R. L. Rhea 547,681
Current motor, O. A. Petterson 547,564
Curtain pole, G. Rommel 547,502
Curtain, storm, G. Maust 547,733
Cut-off, J. H. Dousman 547,483
Cutter. See Butter or cheese cutter. Meat cutter. Pipe cutter.
Cutter head, H. Schmidt 547,455
Cutting-off tool attachment, J. F. Crudginton 547,664
Cycle wheel adjustment, A. Perkins 547,523
Damper, furnace, C. J. Ridgway 547,452
Damper, open fireplace, E. J. Smith 547,567
Dampers, means for controlling, R. L. Short 547,461
Dental articulator, J. H. Downie 547,599
Dental bridgework, A. S. Condit 547,712
Differential brake, W. S. Adams 547,471
Door lock, cell, C. B. Case 547,626
Dough cutting machines, salt sprinkler for, J. L. Causey 547,418
Dredging or pumping gritty fluids, apparatus for, B. H. Coffey 547,538
Drier. See Clothes drier.
Drilling machine, Reiss & Crocker 547,741
Drilling machine, V. F. Prentice 547,588
Earth boring and drilling machine, W. E. Everitt 547,601
Electric heater, time controlled, L. E. Custer 547,714
Elevator safety device, C. A. Macy 547,493
Engine. See air engine. Gas engine. Petroleum or hydrocarbon engine. Pumping engine. Steam engine.
Excavator, A. McDonald 547,672
Fabric cutting and embossing device, B. Karfiol 547,438
Farm gate, C. Wetzel 547,595
Feed operating device, C. G. Barth 547,474
Feed water purifier, T. Gunning 547,719
Fence, wire, G. Bryant 547,479
Fence, wire, W. Culveyhouse 547,421
Fence wire stretcher, J. W. Day 547,716
Fencing, G. C. Bovey 547,415
Fender. See car fender. Wheel fender.
Fiber curling machine, Flower & Rhoades 547,751
Fibers, machine for crimping animal and vegetable, S. A. Flower 547,686
Files, etc., machine for cleaning, S. Nicholson 547,445
Filter, water, G. B. Heideman 547,547
Firearm, magazine, R. C. Fay 547,602
Firearm, recoil operated, L. Schmeisser 547,454
Fire escape, F. M. Quinn 547,490
Fire kindling cartridge, L. S. Flatau 547,635
Fish meal, preparing, R. Herwig 547,548
Flooring, machine for manufacturing, J. P. Burnham 547,481
Foot board, adjustable, T. H. & E. Gardner 547,517
Fruit clipper, J. P. Anderson 547,408
Furnace, J. H. Nicholson 547,586
Furnace traveling grate, G. Playford 547,738
Furnaces, air and steam feeding device for, T. Murphy 547,670
Gas engine, J. J. Bordman 547,414
Gate. See farm gate.
Gate, Wolfe & Reece 547,467
Gear teeth, apparatus for cutting, H. C. Warren 547,571
Glass, apparatus for rolling plate, F. P. Davidson 547,630
Glass press, C. V. Arbogast 547,705
Gold or silver ores, reagent for working, E. Noriega 547,674
Grain binder, H. Tuttle 547,695, 547,699
Grain binder band making machine, H. Tuttle 547,696
Grain binder, straw band, H. Tuttle 547,697
Grain binders, means for making straw bands for, H. Tuttle 547,698, 547,700
Grain heater and steamer, A. C. Brantingham 547,597
Gun, machine, A. G. Dougherty 547,717
Gun, magazine bolt, J. P. Lee 547,583
Guns, apparatus for mounting, J. Strauss 547,507
Guns, cartridge lifter for magazine, R. C. Fay 547,603
Hat brim stretching machine, C. B. Schumann 547,687
Heater. See electric heater. Grain heater.
Heater, C. W. Levalley 547,440
Heating apparatus, W. H. Page 547,677
Hinge, F. Holland 547,435
Hinge, gate, J. S. Maxwell 547,559
Hoof trimming implement, O. Wilbanks 547,703
Hook. See snap book.
Horseshoe ice calk, R. Abell 547,407
Household utensil, combination, J. G. Hunziker 547,488
Hydrocarbon burner, C. Ball 547,473
Hydrocarbon burner, E. G. Mummery et al 547,562
Indicator. See station indicator.
Insulator pin and insulator, C. F. Carroll 547,660
Irrigating pipe, A. Richter 547,501
Jack. See shoemaker's jack.
Joint for parts of machinery, O. Cullmann 547,629
Kiln, F. Macarthy 547,492
Kiln for burning decorated china, etc., C. H. Land 547,646
Knee pad, A. C. Bull 547,480
Knife blank, table, T. B. Wilcox 547,622
Knitting machine for tuck stitch goods, circular, J. Schiesser 547,684
Lamp, electric arc, H. E. Bradley 547,659
Lamps, cut out for arc, D. Higham 547,753
Last standard and last, F. P. Olds 547,648
Lead machine, black, Schraubstadter, Jr., & Schilling 547,456
Linotype machine, P. T. Dodge 547,633
Linotype matter, unleading machine for, F. Peterhansl 547,448
Liquid raiser, E. Kaselowsky 547,723
Liquid raising apparatus, Dyer & Burke 547,634
Lock. See door lock. Permutation lock.
Lock cover, P. Hopkins 547,550
Lowering objects, device for, J. M. Seymour 547,459
Marine conveyance, J. Dean 547,422
Marker, stock, A. L. Eaton 547,424
Mattress, wire, Shaw & Gail 547,743
Meat cutter, O. D. Woodruff 547,468
Mechanical movement, J. L. Oakes 547,446
Medicine case, revolving, P. J. Keegan 547,552
Merry-go-round, H. S. Moore 547,614
Metal cutting and folding machine, M. A. Clennam 547,750
Metal plates, hand tool for cutting holes in, B. Haigh 547,665
Mill. See sawmill. Windmill.
Milling machine, Reiss & Crocker 547,740
Mining apparatus, hydraulic, A. McDougall 547,496
Miter box, S. P. Lerch 547,520
Mixing apparatus, M. J. E. Laurans et al 547,725
Moistening and applying postage stamps, device for, R. M. Higgins 547,666
Mortiser, oscillatory chain saw, J. Anthon 547,572
Motor. See air motor. Current motor. Stamp motor. Water motor.
Mowing machine, E. J. Birkett 547,411
Music box driving gear, H. Langfelder 547,610
Nail presenting and driving mechanism, F. Chase 547,662
Nail presenting mechanism, F. Chase 547,663
Nut and bolt lock, A. P. Lord 547,491
Nut lock, J. L. Bonham 547,373
Nut lock, H. G. Lane 547,724
Nut lock, Peters & Ward 547,678
Ordnance sight, W. H. Driggs 547,423
Organs. Electric key action for pipe, E. S. Votey et al 547,568
Pad. See knee pad.
Paper folding and cutting machine, J. Victor 547,651
Pattern card, R. Knosehke 547,439
Pea and corn shelling machine, combined, B. F. & G. W. O'Kelley, Jr 547,737
Penholder, H. C. Hyde 547,551
Perambulating chair, L. A. Chichester 547,419
Permutation lock, H. Thoele 547,527
Pessary, Cannon & Held 547,625
Petroleum or hydrocarbon engine, W. E. Gibbon 547,606
Phase modification, H. A. Rowland 547,683
Photographic camera shutter, W. V. Esmond 547,541
Photographic plate holder, O. W. Hodges 547,487
Picture frame, H. V. Young 547,469
Pile fabric, woven, H. J. Hope 547,608
Pin locking device, scarf, R. E. Lutters 547,757
Pipe. See irrigating pipe.
Pipe coupling, flexible, W. Scott 547,504
Pipe cutter and threader, J. J. O'Donohue 547,615
Pipe wrench, Wiegand & Burr 547,653
Pistol, magazine, Paquot & Engh 547,447
Planter, seed, J. A. Mengel 547,521
Plow, S. D. Poole 547,500
Plow colter attachment, Bridges & Middleton 547,708
Power generating system, H. E. Grant 547,427
Press. See glass press. Printing press.
Pressure regulator, R. H. Rudolph 547,742
Printer's galley, A. W. Townshend 547,715
Printing machine, Banta & Black 547,409
Printing machine, platen, A. Godfrey 547,577
Printing press, S. G. Wells 547,758
Puller. See Cork puller. Weed puller.
Pulley expansible, Kennerly & Cox 547,641
Pump, bucket, D. Strickler 547,691
Pumps, adjuster for oil well, S. D. Peterson 547,563
Pumping engine, A. P. Massey 547,558
Pumping gritty fluids, method of and apparatus for, Fuller & Coffey 547,576
Punching machine, J. M. Long 547,554
Racking liquids, etc., apparatus for, W. & W. W. Crawford 547,627
Rail joint, B. E. Edwards 547,575
Rail joint, E. Lane 547,668
Railway, overhead bicycle, Weaver & Phillips 547,528
Railway signal, H. Elliot 547,515
Railway tie, J. Quinn 547,739
Railway tie and fastening, metal, J. Barkley 547,706
Railway tracks, frog and guard rail for, Thomas & Douglas 547,464
Receptacle top, A. L. Baron 547,657
Regulator. See Pressure regulator.
Reversing mechanism, F. L. O. Wadsworth 547,701
Revolver ejector, F. Smith 547,525
Roller for fulling mills, etc., J. E. Hunter 547,518
Sandpapering machine, G. F. Hartley 547,430
Sawmill, J. A. Hauser 547,432
Sawing machine, wood, A. Hazewinkel 547,433
Screen frame, W. M. & H. C. Lusk 547,585
Screw threading machine, Brown & Smith 547,417
Seat or cushion, M. Strauss 547,690
Seeder, broadcast, A. Ring 547,524
Separating light from heavier material, apparatus for, J. Jessen 547,609
Sewing machine, W. F. Dial 547,632
Sewing machine, L. Onderdonk 547,675
Sewing machine, J. Ott 547,499
Sewing machine feeding mechanism, L Onderdonk 547,676
Sewing machine trimming knife, C. McNeil 547,673
Shackle for wire guys, etc., L. King 547,642
Shoemaker's jack, R. H. Derr 547,631
Sifter, ash, A. Wolff 547,510
Sifting machine, A. C. Brantingham 547,596, 547,598
Signal. See Railway signal.
Slat adjuster, W. S. Castor 547,711
Slate, school, E. Reese 547,618
Snap hook, T. D. Morris 547,444
Sole and heel, pneumatic, J. Lacroix 547,645
Soles of shoes, compound for waterproofing, E. H. Lewis 547,584
Spectacle holder, A. Zestermann 547,470
Spindle machine spindle bearing, T. Ward 547,621
Square, try and bevel, J. E. Duncan 547,540
Stamp attachment, time, P. G. Giroud 547,546
Stamp motor, time, P. G. Giroud 547,426
Stamp, time, P. G. Giroud 547,545
Staple driver, J. R. Kline 547,756
Station indicator, W. A. Turner 547,592
Stay, garment, E. Roderstein 547,682
Steam engine, W. C. Kelly 547,580, 547,581
Stopper. See Bottle stopper.
Striking or punching apparatus, J. P. MacLearn 547,730, 547,731
Switch and fuse box, J. B. Smith 547,591
Switch operating device, S. Walters 547,594
Table. See Card table. Cigar rolling table.
Telephone switch, W. M. Miner 547,613
Telephone system, F. D. Shepard 547,460
Telephone system, automatic, G. K. Hutchins 547,755
Terret for saddletrees, adjustable, C. M. Williams 547,704
Thill coupling, H. Gaw 547,637
Thill coupling, J. Johnson 547,722
Thill coupling, Lucas & Mooney 547,729
Thill coupling, J. C. Walker 547,570
Thill coupling and horse detacher, combined, R. W. Howell 547,754
Thrashing machine straw separator and carrier, J. G. Snyder 547,526
Thread and needle safe, J. Notkin 547,736
Till, voucher, G. H. Gledhill 547,485
Tire, bicycle, J. & E. P. Forbes 547,752
Toaster or broiler, C. Wagoner 547,593
Tobacco pipe cover, A. A. Percy 547,616
Toy, A. H. Keller 547,553
Trap. See Animal trap.
Trolley track, A. Schumacher 547,457
Truck, J. J. Pratt 547,617
Truck, barrel, H. E. Whisler 547,466
Truck, car, W. S. Adams 547,472
Truck, motor, Brill & Adams 547,476
Trunk, M. M. Secor 547,458
Tube scraper, V. Radspinner 547,451
Type writing machine, E. Terry 547,509
Type writing machine attachment, T. H. Burchell 547,513
Valve controller, G. Hill 547,434
Valve for flushing tanks, slow closing, W. Scott 547,503
Valve, inflation, G. W. Bennum 547,512
Valve, pressure regulating, Sleigh & De Long 547,506
Valve, reciprocating, J. Bonner 547,413
Valve, slow closing, W. Scott 547,505
Valve, steam actuated, G. A. & E. Bartholomew 547,623
Vehicle gear, E. L. Tennant 547,692
Velocipede, A. Wolfmuller 547,511
Velocipede driving mechanism, R. Mieble 547,612
Vending machine and goods displaying device, combined coin operated, D. E. Whitton 547,748
Vending machines, coin introducing device for coin controlled, W. H. Gilman 547,544
Wagon, dumping, G. B. Gay 547,605
Washboard, R. J. Hartwick 547,431
Washing machine, W. E. Baker 547,655
Washing machine, S. B. Meyers 547,669
Water heating boiler, J. Mersereau 547,560
Water motor, J. W. Kales 547,667
Water purifier, J. Cassard 547,710
Water purifying apparatus, F. Reynolds 547,680
Water tube boiler, N. W. Pratt 547,565
Weed puller, F. W. Read 547,679
Weight holder, automatic, W. F. Hood 547,549
Welt beating and shoe trimming machine, C. Dancel 547,715
Wheel. See Bicycle wheel.
Wheel fender, H. Claude 547,482
Windmill, N. Johnson 547,437
Wire weaving loom, J. W. White 547,530
Wood cutting machine, J. G. Kreis 547,490
Wrapping machine, newspaper, D. Wrigley 547,551
Wrench. See Pipe wrench.
Wrench, A. D. Barnett 547,534
Wringer. See Clothes wringer.
Zinc from complex ores, extracting, C. V. Petraeus 547,587

DESIGNS.

Buckle, W. A. Schleicher 24,731, 24,732
Clock case, E. Roth 24,736
Eyeglass case, J. G. Koenen 24,735
Lamp, T. Ferguson 24,737
Lamp, D. H. Watts 24,738
Medal, Jackson & Hammond 24,733
Mirror plateau, H. E. Biggins 24,739
Sifter, Paulman & Sensabaugh 24,741
Slop jar, C. E. Haviland 24,740
Spoon, G. W. Shiebler 24,734
Stove, heating, F. Kaempen, Jr 24,744
Tinning machine grease pot, Brangham & Harris 24,743
Vehicle step pad, J. Hummel 24,742
Woven fabric, H. E. Parkhurst 24,746
Woven fabric, J. Phillips, Jr 24,747, 24,748
Woven fabric, W. T. Smith 24,745

TRADE MARKS.

Antiseptic lotions and dressings, Electrozone Company 27,136
Baking powder, Ransom Brothers Company 27,137
Baking powder, cakes, bread, and salt, G. Weddell 27,138
Bicycles and bicycle supplies, Liberty Cycle Company 27,145, 27,146
Bicycles and parts thereof, F. C. Rockwell 27,147
Blood purifier, A. F. Gwinner 27,132
Cocoa, chocolate, and broma and similar goods, Brewster Cocoa Manufacturing Company 27,140
Corsets and ladies' underwear, Bortree Corset Company 27,129
Food for infants and invalids, F. E. Tenney 27,139
Glass chimneys and reflectors, Gill Brothers & Company 27,144
Lemons, C. O. Brown 27,141
Lozenges and candy, O. H. Peckham Candy Manufacturing Company 27,142
Remedies for diseases in hogs, J. Garrett 27,149
Roofing felt, Mica Roofing Company 27,143
Salve, E. W. Wheaton 27,133
Soap, perfumery, and cosmetics, C. R. Bailey 27,134
Wash for the face, mouth, and throat, A. Kjollerstrom 27,135
Water closets, washdown, F. A. Wells 27,148
Whisky, Steinhardt Brothers & Company 27,131
Wines, L. Gandolfi & Company 27,130
Woolen goods, piece, Firm of A. Knops 27,128

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 25 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

Advertisements.

ORDINARY RATES.

Inside Page, each insertion - - 75 cents a line
Back Page, each insertion - - - - $1.00 a line

☞ *For some classes of Advertisements, Special and Higher rates are required.*

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.

WOOD or METAL WORKERS without steam power can save *time* and *money* by using our **Foot and Hand Power Machinery**
SEND FOR CATALOGUES—
A—Wood-working Machinery.
B—Lathes, etc.
SENECA FALLS MFG. COMPANY,
695 Water St., Seneca Falls, N. Y.

AMERICAN PATENTS.—AN INTERESTING and valuable table showing the number of patents granted for the various subjects upon which petitions have been filed from the beginning down to December 31, 1894. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1002.** Price 10 cents. To be had at this office and from all newsdealers.

POWER & FOOT LATHES. SHAPERS, PLANERS, DRILLS, MACHINE SHOP OUTFITS, TOOLS AND SUPPLIES. CATALOGUE FREE. SEBASTIAN LATHE CO. 120 CULVERT ST. CINCINNATI, O.

Scientific Book Catalogue

RECENTLY PUBLISHED.

Our New Catalogue containing over 100 pages, including works on more than fifty different subjects. Will be mailed free to any address on application.
MUNN & CO., *Publishers* SCIENTIFIC AMERICAN,
361 Broadway, New York.

HAVE YOU SEEN The New Green River Al Drilling Machine?
Everything done—drilling and reversing—with one hand without taking it from crank. Price - - **$15.00**
☞ *Send for Catalogue.*
WILEY & RUSSELL MFG. CO.
Greenfield, Mass., U. S. A.

OUR WELL DRILLS
awarded Highest Medal at the World's Fair.
All latest improvements. Catalogue free.
F. C. AUSTIN MFG. CO., CHICAGO, ILL.

ARTESIAN WELLS.—BY PROF. E. G. Smith. A paper on artesian wells as a source of water supply. Essential geological conditions of artesian wells. Some chemical features of artesian well supply. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **943.** Price 10 cents. To be had at this office and from all newsdealers.

BARNES' New Friction Disk Drill.
FOR LIGHT WORK.
Has these Great Advantages:
The speed can be instantly changed from 0 to 1600 without stopping or shifting belts. Power applied can be graduated to drive, with equal safety, the smallest or largest drills within its range—a wonderful economy in time and great saving in drill breakage. Send for catalogue.
W. F. & JNO. BARNES CO.,
1999 Ruby St., - Rockford, Ill.

Manufacturers & Promoters
Send samples or drawings for estimates. Wire Bending. Light Machinery. Sheet Metal Work.
L. R. HITCHCOCK, Watertown, Conn.

FERRILITE COMPOUND AND PAINT BEST MADE FOR TIN AND IRON ROOFS. STRUCTURAL IRON WORK & C. SAMPLES AND PRICES ON APPLICATION. EAGLE PAINT & VARNISH WORKS PITTSBURG PA.

LITTLE GIANT BOLT CUTTERS and NUT TAPPERS.

Complete with Tap Chuck, Taps, Dies, and Collets. Cutting 9 sizes, from ¼ to 1 inch. Has improved clutch on spindle for running die off after thread is cut, making quick return.
☞ *Send for fully illustrated catalogue.*
WELLS BROS. & CO., P. O. Box B, Greenfield, Mass.

IDEAS DEVELOPED. Absolute secrecy. Send for particulars. Advice and suggestions free. Correspondence and sample orders solicited. 25 years in business. **Gardam & Son,** 98 John St., New York.

ARMSTRONG'S * PIPE * THREADING —AND— CUTTING-OFF MACHINES

Both Hand and Power.
Sizes 1 to 6 inches.
Water, Gas, and Steam Fitters' Tools, Hinged Pipe Vises, Pipe Cutters. *Stocks and Dies universally acknowledged to be* THE BEST. ☞ *Send for catalog.*
Armstrong Mfg. Co., Bridgeport, Conn.

THE ORNAMENTAL IRON INDUSTRY.—Description of the method of manufacturing wrought iron into ornamental and artistic forms. With 9 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1020.** Price 10 cents. To be had at this office and from all newsdealers.

GATES ROCK AND ORE BREAKERS
OVER 3000 IN USE THROUGHOUT THE WORLD
GREATER CAPACITY USING LESS POWER THAN ANY OTHER ON EARTH
MODERN MINING MACHINERY OF EVERY DESCRIPTION
GATES IRON WORKS DEPT T 650 ELSTON AVE CHICAGO.

HYPNOTISM My original method $2. 100 pp. pamphlet 10c. One on Personal Magnetism 10c. **Dr. Anderson, S A 7, Masonic Temple, Chicago.**

EMPIRE • BOILER CLEANER • COMPOUND
We Don't Offer Gratuities, but our Circular will give you the information that will enable you to **Save Time, Trouble and Money.** *Tried, approved, and being used by the Largest Railways and Factories in the East.*
OFFICE:
Kemble Bldg., 19 Whitehall St., N.Y.

THE CARBIDES AND ACETYLENE Commercially Considered.—By T. L. Willson and J. J. Suckert, Ph.D. A consideration of the carbides and acetylene from a commercial point of view, preceded by a brief history of these compounds, the methods of their formation, and their chemical and physical properties. With 10 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **1015** and **1016.** Price 10 cents each. To be had at this office and from all newsdealers.

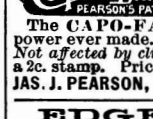
They All Like It. The Ladies Like It. So Do The Men. Children Enjoy It.
Layman Pneumatic Boats.
☞ See SCI. AM., May 18, 1895.
Send 4c. in stamps for our handsomely illustrated catalogue.
Address H. D. LAYMAN,
30 West 29th St., cor. Broadway,
NEW YORK.

BUY TELEPHONES
That are good—not "cheap things." The difference in cost is little. We guarantee our apparatus and guarantee our customers against loss by patent suits. Our guarantee and instruments are **BOTH GOOD.**
WESTERN TELEPHONE CONSTRUCTION CO.,
440 Monadnock Block, CHICAGO.
Largest Manufacturers of Telephones in the United States

HELLO, CENTRAL!
Do you use telephones? If so, we can give you just what you want. Our specialty is Blake Transmitters. There is a "best" in everything, and ours are the best. We supply complete telephones or all or any of the parts to construct a telephone. Write for illustrated catalogue.
PHŒNIX INTERIOR TELEPHONE CO.,
131 Liberty St., New York.

HARLEM RIVER IMPROVEMENT and Ship Canal.—An interesting account of the great government work recently completed in New York City. With 3 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1015.** Price 10 cents. To be had at this office and from all newsdealers.

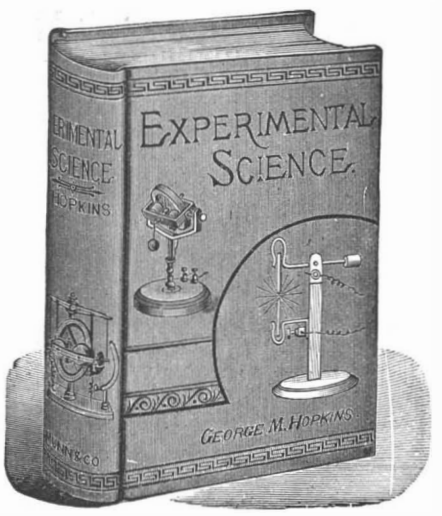
HELLO!
Our New 50c. Telephone
Entirely new and original. The receivers of this Outfit are so constructed that they have extraordinary acoustic properties. A whisper may be plainly heard at 500 ft. No battery required. Receivers are imitation hard rubber, the same in form as used on regular instruments. For inside and all short lines this is better than a $100 Outfit. Complete for both ends with all accessories and instructions for using. Sent by express on receipt of 50c. or by mail for 8c. extra.
R. H. INGERSOLL & BRO. 65 CORTLANDT ST. N. Y. CITY.



Volts 1.25
Amps. 2.00
Size 11-16" x 2 3-4"
The **CAPO-FARAD** is the smallest Battery of its power ever made. Requires neither care nor attention. *Not affected by climate.* Always ready, and mails under a 2c. stamp. Price, **$1.15** each, by mail.
JAS. J. PEARSON, 27 Thames Street, New York, U. S. A.

EDGE TOOLS
are often nearly ruined by using a grindstone not adapted to the work. Our quarries produce a large variety of grits suitable for grinding any tool.
☞ *May we send you our Catalogue, which will give you some information?*
GRAFTON STONE COMPANY,
No. 80 River Street, GRAFTON, OHIO.

A Valuable Book



12,500 Receipts. 708 Pages. Price $5.
Bound in Sheep, **$6.** *Half-Morocco,* **$6.50.**

This splendid work contains a careful compilation of the most useful Receipts and Replies given in the Notes and Queries of correspondents as published in the Scientific American during the past fifty years; together with many valuable and important additions.

Over Twelve Thousand selected Receipts are here collected; nearly every branch of the useful arts being represented. It is by far the most comprehensive volume of the kind ever placed before the public.

The work may be regarded as the product of the studies and practical experience of the ablest chemists and workers in all parts of the world; the information given being of the highest value, arranged and condensed in concise form convenient for ready use.

Almost every inquiry that can be thought of, relating to formulæ used in the various manufacturing industries, will here be found answered.

Instructions for working many different processes in the arts are given.

Those who are engaged in any branch of industry probably will find in this book much that is of practical value in their respective callings.

Those who are in search of independent business or employment, relating to the home manufacture of sample articles, will find in it hundreds of most excellent suggestions.

☞ *Send for Descriptive Circular.*

MUNN & CO., Publishers,
SCIENTIFIC AMERICAN OFFICE.
361 Broadway, New York.

© 1895 SCIENTIFIC AMERICAN, INC.

Founded by Mathew Carey, 1785.

HENRY CAREY BAIRD & CO.
INDUSTRIAL PUBLISHERS, BOOKSELLERS & IMPORTERS
810 Walnut St., Philadelphia, Pa., U. S. A.

☞ Our New and Revised Catalogue of Practical and Scientific Books, 90 pages, 8vo, and our other Catalogues and Circulars, the whole covering every branch of Science applied to the Arts, sent free and free of postage to any one in any part of the world who will furnish his address.

Now ready. Plate and India paper (Sheet Demy).

The Cathedrals of England and Wales.

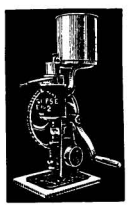
Library Edition (limited to 250 copies), containing 62 Plates (Views and Plans), with descriptive letterpress, republished from *The Builder*, revised and partly rewritten. Unbound (in portfolio), 3*l.* 13*s.* 6*d.*, American price, $29.40; bound (whole buckram), 4*l.* 4*s.*, American price, $33.60. "The drawings are certainly very beautiful."—*The Times.* "A very attractive publication."—*Morning Post.* "A noble volume."—*Pall Mall Gazette.* "A most interesting and useful work"—*Guardian.*
Address Publisher of *The Builder*, 46 Catherine Street, London, W. C., England.

THE "ROUND BOX" TYPEWRITER RIBBONS
M. & M. CARBON PAPERS.
Give perfect satisfaction when others fail. Used by nearly all United States Government Departments.
Samples Free upon application.
MITTAG & VOLGER,
Manufacturers for the Trade,
Cor. Park & B.R. Aves., Park Ridge, N. J.

Excursion Rates To Atlanta.

On account of the Atlanta Exposition, the B. & O. RR. Co. will sell excursion tickets at greatly reduced rates. Season tickets will be sold every day until December 15th, good returning until January 7th, 1896. Twenty-day tickets will be sold every day until December 15th, good returning for twenty days from date of sale. Ten-day tickets will be sold Tuesday and Thursday each week until December 24th, good returning for ten days from date of sale. The rates from New York will be $37.25 for season. $29.25 for twenty-day, and $24.00 for ten-day tickets.

Correspondingly low rates from other points on the line.

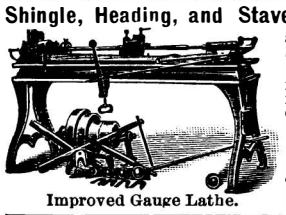


Eclipse Cream Separators

are Closest Skimmers, Most Durable, Easiest Running, and far the Simplest Hand or Power Separator on the market. ☞ *Agents Wanted.*
C. L. CHAPMAN SEPARATOR WORKS, LITTLE FALLS, N. Y.

SCIENTIFIC AMERICAN DYNAMO. Description of a plain shunt-wound dynamo of simple construction, capable of supplying a current of from 60 to 75 110-volt incandescent lamps, or of being used as a 5 h. p motor. This machine was constructed especially for the benefit of the readers of the *Scientific American*, by Mr. W. S. Bishop, of New Haven, Conn. It is designed to meet the wants of mechanics and amateurs who desire to construct a simple dynamo for their own use, but who do not care to enter into the subject scientifically. With 24 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **865.** Price 10 cents. To be had at this office and from all newsdealers.

Shingle, Heading, and Stave Mill Machinery



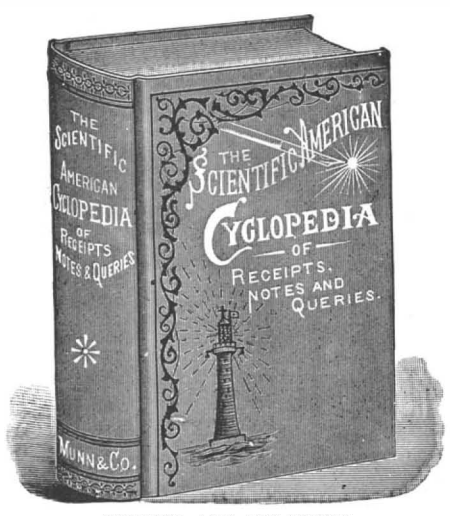
Improved Gauge Lathe.

and Veneer Cutting. *Send for Cat. A.*
Handle Machinery for Turning Handles for Brooms, Axes, etc. *Send for Cat. B.*
Wood Pulp Machinery. *Send for Cat. C.*
Trevor Mfg. Co. Lockport, N. Y.

NOW READY!

Seventeenth Edition of

Experimental Science



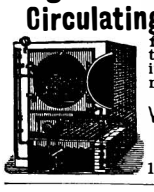
REVISED AND ENLARGED.
120 Pages and 110 Superb Cuts added.

Just the thing for a holiday present for any man, woman, student, teacher, or anyone interested in science.
In the new matter contained in the last edition will be found the Scientific Use of the Phonograph, the curious optical illusion known as the Anorthoscope, together with other new and interesting Optical Illusions, the Optical Projection of Opaque Objects, new experiments in Projection, Iridescent Glass, some points in Photography, including Hand Cameras, Cane Cameras, etc.; Systems of Electrical Distribution, Electrical Ore Finder, Electrical Rocker, Electric Chimes, How to Color Lantern Slides, Study of the Stars, and a great deal of other new matter which will prove of interest to scientific readers.
840 pages, 782 fine cuts, substantially and beautifully bound. Price in cloth, by mail, $4. Half morocco, $5.
☞ *Send for illustrated circular.*
MUNN & CO., Publishers.
Office of the SCIENTIFIC AMERICAN,
361 BROADWAY, NEW YORK.

VELOX PAPER A Revolution in Photographic Printing.
When exposed to the same light, prints 500 times quicker than albumen. . .
GLOSSY or MATT. No dull or rainy weather to interfere with your work. No dark rooms nor complicated manipulation.
Developed and toned *as fast as the printing frames can be filled. A choice of tones more beautiful than can be produced on any other paper.* Permanent prints. The greatest paper for hot or damp climates. 35 cents in stamps brings two sample dozen cab's, developer and three sample prints. Nepera Platinoid, Enameled and Rough *Bromide Papers* are the best and most uniform in the market. Nepera POP, an *insoluble* gelatine paper.
Nepera Chemical Co., Sole Manufacturers, **Nepera Park, N. Y.**

ON THE ELECTRIFICATION OF THE Air.—A communication to the Philosophical Society of Glasgow, by Lord Kelvin, on the cause of the want of homogeneous distribution of electric density in cloudless air at moderate heights above the earth's surface. With 1 illustration. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1015.** Price 10 cents. To be had at this office and from all newsdealers.

Reagan Feed Water Heating, Water Circulating and Shaking Grates



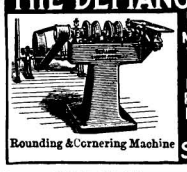
for Stationary, Marine, and Locomotive Boilers. AGENTS WANTED in all parts of the United States to manufacture our grates on royalty.
☞ *Send for Catalogue.*
Water Circulating Grate Co.
Manuf's and Sole Proprietors,
GENERAL OFFICE & WORKS,
1026-1028 Filbert St., PHILA., PA.

DIGESTION IN PLANTS.—BY J. PENTland Smith, M.A., B.Sc. An interesting paper discussing the processes by which food material is rendered available for the nourishment of the plant organism. With 4 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1027.** Price 10 cents. To be had at this office and from all newsdealers.

ARMS & LEGS
WITH RUBBER HANDS & FEET.
The Most Natural, Comfortable and Durable. Over 16,000 in use.
New Patents and Important Improvement. U. S. Gov't Manufacturer.
Illustrated book of 430 pages and formula for measuring sent free.
☞ *See illustrated article in* SCI. AM. *of August 3, 1895.*
A. A. MARKS, 701 Broadway, NEW YORK CITY.

SCIENTIFIC AMERICAN SUPPLEMENT. Any desired back number of the SCIENTIFIC AMERICAN SUPPLEMENT can be had at this office for 10 cents. Also to be had of newsdealers in all parts of the country.

ESTABLISHED 1850.
THE DEFIANCE MACHINE WORKS
No. 401 PERRY ST. DEFIANCE, OHIO, U.S.A.
MANUFACTURERS OF SPECIAL WOOD WORKING MACHINERY FOR HUB, SPOKE, WHEEL, BENDING, WAGON, CARRIAGE, SHAFT, POLE, NECK-YOKE, SINGLETREE, HANDLE & BARREL-HOOP FACTORIES.
LARGEST LINE IN THE WORLD
SATISFACTION GUARANTEED.



Rounding & Cornering Machine

MESSRS. MUNN & CO., Solicitors of Patents, have had nearly fifty years' continuous experience. Any one may quickly ascertain, free, whether an invention probably is patentable by writing to Munn & Co. Communications strictly confidential. A handbook of patents and how to obtain them sent free.

PATENTS

taken through Munn & Co. receive special notice in the *Scientific American*. This splendid weekly paper, elegantly illustrated, has the largest circulation of any scientific work. $3 a year. Specimen copies free.
Address MUNN & CO.,
New York, 361 Broadway.

DO YOU USE GRINDSTONES?
If so, we can supply you. All sizes **mounted and unmounted**, always kept in stock. Remember, we make a specialty of selecting stones for all special purposes. ☞ *Ask for catalogue.*
The CLEVELAND STONE CO.
2d Floor, Wilshire, Cleveland, O.

THE TIN PLATE INDUSTRY IN THE United States.—An interesting paper, showing the extraordinary development of the tin plate industry in this country, and the serious competition into which it is now entering with the British industry. With 18 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **1019, 1020, 1021, 1022** and **1023.** Price 10 cents each, or 50 cents for the series. To be had at this office and from all newsdealers.

Save $8.00.
SUITS and OVERCOATS TO MEASURE
$10.00
AND UPWARDS.
Far superior to any that other tailors charge $18 to $20. We are enabled to save you this amount by buying the entire production of several woolen mills and saving the expenses of traveling men. Goods sent C. O. D., with privilege of examination, and trying on **before you pay for them. We pay express charges.** Write for our new fall and winter novelty catalogue with samples and fashion plate. **All sent free.**
Dept. 26, KRAMER & MAHLER,
111-113-115-117 Monroe St., Chicago.

FARIES TUBE CLEANER

SELF-EXPANDING SCRAPER. NOTHING LIKE IT. NEVER GETS STUCK.
BUY THEM OF YOUR DEALER OR OF US.
FARIES M'F'G CO.,
1054 E. HERKIMER ST., DECATUR, ILL.

PUMPS FOR COMPRESSING OXYGEN & HYDROGEN GASES INTO CYLINDERS BY HAND POWER. PRICE $15.00
SEND FOR CATALOGUE No. 2 TO
CHAS. BESELER,
218 CENTRE ST., NEW YORK.

AT A TEST
of Steam Pipe Coverings bought in open market by the State College of Pennsylvania, for the purpose of conducting a CONDENSATION TEST, our Covering gave
20% better results than - - - John's Asbestos Sponge.
20% better results than - Magnesia Sectional Covering.
27% better results than - - Carey's So-called Asbestos.
50% better results than - Manville Wool Felt Covering.
We offer it at prices to suit the times.
Agents Wanted. *Mention this paper.*
New York Fire Proof Covering Co., 121 Liberty St., N.Y.

Architectural Books

Useful, Beautiful and Cheap.

Any person about to erect a dwelling house or stable, either in the country or city, or any builder wishing to examine the latest and best plans for a church, school house, club house, or any other public building of high or low cost, should procure a complete set of the ARCHITECTS' AND BUILDERS' EDITION of the SCIENTIFIC AMERICAN.
The information these volumes contain renders the work almost indispensable to the architect and builder, and persons about to build for themselves will find the work suggestive and most useful. They contain drawings in perspective and in color, together with floor plans, costs, location of residence, etc.
Two volumes are published annually. Volumes 1 to 18, which include all the numbers of this work from commencement to December, 1894, may now be obtained at this office or from Booksellers and Newsdealers. Price, stitched in paper, $2.00 per volume. These volumes contain all the plates, and all the other interesting matter pertaining to the work. They are of great permanent value. Forwarded to any address.
MUNN & CO., Publishers,
361 Broadway, New York.

CRITERION
STEREOPTICONS, MAGIC LANTERNS & ACCESSORIES.
PERFECT APPARATUS for VISUAL TEACHING
SCIENTIFIC PROJECTIONS & PRIVATE USE.
ELECTRIC FOCUSING LAMPS
For Photo-Engravers, Stage Lighting, Etc.
SEND FOR CATALOG
J.B. COLT & Co.
115-117 NASSAU ST. NEW YORK.
AGENCIES IN BOSTON PHILADELPHIA ATLANTA ST. LOUIS BUFFALO CHICAGO SAN FRANCISCO

MANUAL AND SENSE TRAINING THE Great Problem in Education.—By Peter T. Austen, Ph. D., F.C.S. A plea for the education of the young through the training of their powers of observation, judgment, and reasoning. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1026.** Price 10 cents. To be had at this office and from all newsdealers.

ALCO VAPOR LAUNCH.

Engine and helm controlled from bow. Latest improved and only 12 to 1 motor now ready for the market. 18 to 40 ft. launches 2, 3, 5 and 7 h. p. No licensed engineer or pilot required. *Speed and safety guaranteed. No dangerous naphtha or gasoline used.*
Marine Vapor Engine Co., Jersey City, N. J.

RUSTLESS COATINGS FOR IRON AND Steel.—Paints: of what composed, how destroyed, classification as true pigments and inert substances, adulterants, etc.—By M. P. Wood. The essentials of good paint. The characters that a paint should possess for the purpose of protecting structures from decay or corrosion. Natural and artificial asphalt coatings. Iron oxide paints. Zinc and lead oxides. Carbon paints. Inert pigments. A very exhaustive and valuable paper. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **1017, 1018** and **1019.** Price 10 cents each. To be had at this office and from all newsdealers.

GASOLINE ENGINES.

1½ to 75 horse power. For Propelling Boats of all kinds. Cheapest Fuel, Absolute Safety, No Licensed Engineer, Simple Construction, Hundreds in Successful Use.
☞ *Write for illustrated catalogue.*
GLOBE GAS ENGINE CO.,
Merion Avenue & 49th Street, PHILADELPHIA, PA.

MECHANICAL DRAWING MINNEAPOLIS SEPT. 26 1894 MINN.
Steam Engineering (Stationary, Marine, Locomotive), Electricity, Plumbing, Architecture, Architectural Drawing, Mining, R.R. & Bridge Engin'g.
TAUGHT BY MAIL.
Students make rapid progress in learning to draw. Circular free. State subject you wish to study.
The International Correspondence Schools,
SCRANTON, PA.

DYNAMO No. 161. Finished Castings, etc., with Drum Armature. W. I. BEECROFT, Bangor, Me.

ICE MACHINES. Corliss Engines. Brewers' and Bottlers' Machinery. THE VILTER MFG. Co., 899 Clinton Street, Milwaukee, Wis.

Electrical and Mechanical Fine Machinery. **Model Work.**
M. SANGER, 106 Liberty Street, New York.

CONTRACTS WANTED.
To manufacture Hardware Specialties, Pat'd Novelties and Sheet Metal Stamping. Lang Mfg. Co., Racine, Wis.

NOVELTIES.—Dixie Novelty Co., Ltd., New Orleans, La., buy and sell Patented Novelties. Correspondence with manufacturers and dealers solicited.

STEEL TYPEWRITER TYPE
TYPE WHEELS. MODELS & EXPERIMENTAL WORK. SMALL MACHINERY NOVELTIES & ETC. NEW YORK STENCIL WORKS 100 NASSAU ST. N.Y.

BI-SULPHIDE OF CARBON for use in the arts, Killing Insects in Grain, Killing Burrowing Animals, etc. Manufactured by E. R. TAYLOR, Cleveland, Ohio

DEAFNESS & HEAD NOISES CURED by my Invisible Tubular Ear Cushions. Whispers heard. Warranted to help more cases than all similar devices combined. Help ears as glasses do eyes. Sold by F. Hiscox only, 853 Br'dway, N. Y. Send for book of proofs **FREE**

VOLNEY W. MASON & CO.
FRICTION PULLEYS, CLUTCHES, and ELEVATORS
PROVIDENCE, R. I.

CONSULTATION AND ADVICE TO INVENTORS.
Experimental work of every description. Automatic machinery designed and built. ☞ Send for circular.
MALTBY MFG. CO., Brooklyn, N. Y.

CARBORUNDUM
HARDEST ABRASIVE KNOWN. EMERY AND DIAMOND POWDER SUBSTITUTE. IN FLOUR, POWDER-CRYSTAL-WHEEL-SLAB & HONE FORM.
CARBORUNDUM CO., MONONGAHELA CITY, PA., U.S.A.

Agts want'd **BICYCLES** ON EASY PAYMENTS
New or 2d hand; lowest prices; Mfrs. old reliable Sylphs and Overlands. We sell everywhere. Cats. free. Estab. '64.
Sylph ROUSE, HAZARD & CO., 16 G st., Peoria, Ill.

FOOT POWER LATHES and TOOLS
Send 10 cts. for 224 page Book to
J. M. WATROUS, Cincinnati, O.

For a number of years the SETH THOMAS CLOCK CO., of Thomaston, Conn., has done a good deal of work for Electrical Companies, and would be glad to increase this line of business. They will make estimates for any article akin to Clock Work, for which **A MODEL IS FURNISHED,** and **WHICH IS WANTED IN QUANTITIES.** Address SETH THOMAS CLOCK CO., 49 Maiden Lane, NEW YORK.

FIRE BRICK FOR ALL PURPOSES.
☞ *Send for Prices and Catalogue.*
BROOKLYN FIRE BRICK WORKS.
88 Van Dyke Street, BROOKLYN, N. Y.

DO YOUR OWN PRINTING
$5. PRESS for cards, circulars, &c. Press for printing a small paper $40.
Save money! Make money printing for others! Type-setting easy. Printed rules. Write for catalogue, presses, type, cards, etc., to factory.
KELSEY & CO., Meriden, Conn.

THE MANUFACTURE OF MATCHES. —An interesting and popular description of the method of manufacturing sulphur and safety matches as practiced in France. With 10 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1013.** Price 10 cents. To be had at this office and from all newsdealers.

DEAFNESS
and HEAD NOISES relieved by using
Wilson's Common Sense Ear Drums.
New scientific invention, entirely different in construction from all other devices. Assist the deaf when all other devices fail, and where medical skill has given no relief. Safe, comfortable, and invisible; no wire or string attachment. Write for pamphlet.
WILSON EAR DRUM MANUFG. CO.,
Louisville Trust Co. Building, Louisville, Ky.,
☞ *Mention this paper.* and 1122 Broadway, New York

Star ★ Maps

By Richard A. Proctor, F.R.A.S.

* * *

A series of twelve elegantly printed Maps of the Heavens, one for every month in the year. Specially prepared for use in North America. With descriptions accompanying each map, giving the names of the principal stars and constellations, showing their relative positions at given hours and days of the month.
A most beautiful and convenient work, specially adapted for the use of those who desire to acquire a general knowledge of the starry realms.
To which is added a description of the method of preparing and using artificial luminous stars as an aid in fixing in the mind the names and places of the various stars and constellations, by Alfred E. Beach.
Altogether this is one of the most popular, useful and valuable works of the kind ever published.
One quarto volume, elegantly bound in cloth. Price **$2.50.** postpaid.
MUNN & CO., Publishers,
361 Broadway, New York.

© 1895 SCIENTIFIC AMERICAN, INC.

Advertisements.

ORDINARY RATES.

Inside Page, each insertion, - 75 cents a line
Back Page, each insertion, - - $1.00 a line

☞ *For some classes of Advertisements, Special and Higher rates are required.*

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.

There are two classes of bicycles—

COLUMBIAS

and others

THAT PLATE MEANS Columbia THE BEST BICYCLE

Columbias sell for $100 to everyone alike, and are the finest bicycles the world produces. Other bicycles sell for less, but they are *not* Columbias.

POPE MFG. CO., HARTFORD, CONN.

You See Them Everywhere

STARRETT'S IMPROVED SPEED INDICATOR.

Price $1.50. With Split Cap, $1.75.

Graduations show every revolution, and with two rows of figures, read both right and left as the shaft may run. Auxiliary split cap is made to slip over the pointed spindle to use on a center or pointed shaft.

☞ *Illustrated Catalogue Free.*

The L. S. Starrett Co., Manufacturer of Fine Tools, P. O. Box 13, ATHOL, MASS.

Pocket ··· Kodak

$5.00

Makes pictures large enough to be good for contact printing and good enough to enlarge to any reasonable size.

Pocket Kodak, loaded for 12 pictures, 1½ x 2 in., . . . $5.00
Developing and Printing Outfit, ... 1.50

EASTMAN KODAK CO.,
ROCHESTER, N.Y.

Sample photo and booklet for two 2-cent stamps.

The American Bell Telephone Company;

125 Milk Street, Boston, Mass.

This Company owns Letters-Patent No. 463,569, granted to Emile Berliner November 17, 1891, for a combined Telegraph and Telephone, covering all forms of Microphone Transmitters or contact Telephones.

"IMPROVEMENT THE ORDER OF THE AGE."

Three New Model

Smith Premier Typewriters

Nos. 2, 3 AND 4

HAVE YOU EXAMINED THEM?

Many Improvements Heretofore Overlooked by Other Manufacturers.

Address THE SMITH PREMIER TYPEWRITER COMPANY, Syracuse, N. Y., U. S. A.

BRANCH OFFICES IN TWENTY-NINE PRINCIPAL CITIES IN THE UNITED STATES.

THE BICYCLE: ITS INFLUENCE IN Health and Disease.—By G. M. Hammond, M.D. A valuable and interesting paper in which the subject is exhaustively treated from the following standpoints: 1. The use of the cycle by persons in health. 2. The use of the cycle by persons diseased. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1002**. Price 10 cents. To be had at this office and from all newsdealers.

. . . WE ARE BUILDING . . .

The Celebrated

"HORNSBY-AKROYD" OIL ENGINE

The De La Vergne Refrigerating Machine Co.

FOOT E. 138TH STREET, NEW YORK.

HALF A CENTURY OF CYCLES.—AN interesting history of the cycle from its origin up to the present time. The first crank-driven bicycle. The "bone-shaker" and its successors. The tricycle. The modern wheel. Cycle building a science. Points of improvement. The pneumatic tire. A hand and foot cycle. With 9 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1012**. Price 10 cents. To be had at this office and from all newsdealers.

AGENTS WANTED WRITE FOR CATALOGUE AND AGENCY. FOR FINE TOOLS IN EVERY SHOP. **C. H. BESLY & CO.** CHICAGO, ILL. U.S.A.

The Scientific American Reference Book.

A most useful little bound book of 150 pages, comprising, probably, the most extensive variety of standard, practical, condensed information ever furnished to the public for so small a price, only 25 cents.

Among its contents are: The Last Census of the United States (1890), by States, Territories, and Counties; Table of Cities having over 8,000 inhabitants; Map of the United States—miniature outline; The Patent Laws full text); The Trade Mark Law (full text); The Copyright Law (full text); The Principal Mechanical Movements—illustrated by 150 small diagrams—of value to inventors and designers of mechanism; Medallion Portraits of Distinguished American Inventors; Valuable Tables relating to Steam, Electricity, Heat, Metals, Weights, and Measures.

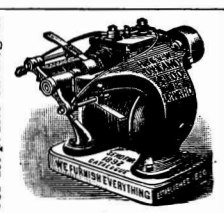
☞ *Sent by mail to any address on receipt of price,* **25 cents.**

MUNN & CO., Publishers,
361 Broadway, New York.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO. HARTFORD, CONN.

CAUSE OF LUMINOSITY IN THE Flames of the Hydrocarbon Gases.—By Prof. Vivian B. Lewes. An important paper in which the author endeavors to show that the luminosity of hydrocarbon flames is due to the localization of the heat of formation of acetylene in the carbon and hydrogen produced by its decomposition, and the cause of such localization. Contained in SCIENTIFIC AMERICAN SUPPLEMENT. Nos. **1012** and **1013**. Price 10 cents each. To be had at this office and from all newsdealers.

Send your business card for 150 p. 1895 catalogue.



NICKEL AND ELECTRO-PLATING

Apparatus and Material.

THE Hanson & Van Winkle Co.
Newark, N. J.
81 LIBERTY ST., N. Y.
35 & 37 S. CANAL ST., CHICAGO.

THE AGE OF THE EARTH.—AN INteresting paper by John Perry, in which the author discusses the subject very generally, with a view to clearing away the misapprehensions that exist among modern geologists and palæontologists, who are no longer uniformitarians, and physicists who are represented by Lord Kelvin. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1012**. Price 10 cents. To be had at this office and from all newsdealers.

Durable—Easily Applied.

This roofing is manufactured from natural Trinidad asphalt materials, and will not dry up and become brittle under exposure to the weather as coal-tar roofings do. ☞ *Send for free sample of roof 12 years old, with circular and price list to*

WARREN CHEMICAL & MFG. CO.,
85 Fulton Street,
New York, U. S. A.

1¼ to 50 H. P. THE

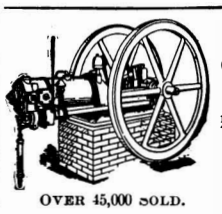
Motor of 19th Century

Can be used *any place*, to do *any work*, and by *any one*. No Boiler! No Fire! No Steam! No Ashes! No Gauges! No Engineer! A perfectly safe Motor for all places and purposes. *Cost of operation about one cent an hour to each indicated horse power.* For circulars, etc., address

Charter Gas Engine Co.
P. O. Box 148, Sterling, Ill.

ECONOMY, RELIABILITY SIMPLICITY, SAFETY.

AUTOMOBILE CARRIAGES: THE Paris-Bordeaux-Paris Race of.—Brief account of the performance of the vehicles that obtained the prizes in the competition instituted by the Petit Journal. With 9 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1023**. Price 10 cents. To be had at this office and from all newsdealers.



OVER 45,000 SOLD.

"OTTO" GAS AND GASOLINE ENGINES.

½ to 100 h. p. Can be used in cities or in country independent of gas works or gas machines.

No Boiler, No Danger, No Engineer.

The Otto Gas Engine Wks., Incorp'd, Philadelphia

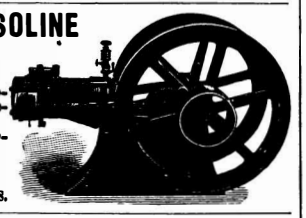
GAS AND GASOLINE ENGINES.

½ to 15 H. P.

Suitable for pumping or any work requiring power.

Prices, etc., upon application.

PIERCE ENGINE CO.
17 N. 17th St., Racine, Wis.



ELECTRO-CHEMISTRY, RECENT ADvances in.—By J. W. Richards, A.C., Ph.D. A very exhaustive and interesting paper on the progress that has recently been made in the apparatus for and methods of prosecuting work in the domain of electro-chemistry. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **1014** and **1015**. Price 10 cents each. To be had at this office and from all newsdealers.

PRIESTMAN SAFETY OIL ENGINE

"Phenomenally low in cost of operation."—Franklin Inst.

NEITHER STEAM NOR ENGINEER

Kerosene, NOT Gasoline

Economical, Simple, Safe, Automatic. For Electric Lighting, Pumping, Milling, etc.

PRIESTMAN & COMPANY, Inc.
Front and Tasker Streets, - - Philadelphia

VANDUZEN STEAM JET PUMP

THE BEST IN THE WORLD.

Pumps Any Kind of Liquid.

Always in Order, never Clogs nor freezes. Every Pump Guaranteed.

10 SIZES.

200 to 12000 Gallons per Hour. Cost $7 to $75 each. Address

THE E. W. VANDUZEN CO.,
102 to 108 E. Second St., Cincinnati, O.

Towers, Tanks and Tubs

PATENT SECTIONAL

ALL IRON TOWERS

PLAIN

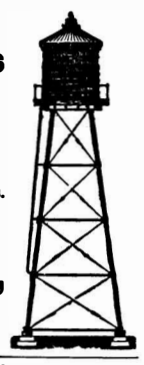
ALL WOOD TOWERS.

ELEVATED TANKS

for Automatic Fire Sprinkler Plants.

Louisiana Red Cypress Tanks a Specialty.

W. E. CALDWELL CO.,
219 E. Main Street,
LOUISVILLE, KY., U. S. A.



$26.50. An 8 Light 16 C.P. 110 Volt Dynamo

Not a toy, but a high grade, substantial machine, which we guarantee to do all we claim for it. We place this machine on the market at above low price in order to introduce our Dynamos and Motors of larger sizes.

☞ *Send for circular* No. 26.

ROTH BROS. & CO.,
30 to 34 Market St.,
Chicago, Ill., U.S.A.

Measuring Tapes.

Chesterman's, Excelsior, Lufkin's, Eddy's, Roe's, etc., and supplies of all kinds for Architects, Engineers and Draughtsmen.

Frost & Adams Co.
Established in 1848.
39 Cornhill,
BOSTON, MASS.

ENGINES, Boilers and Machine Tools. New and Second-hand. *Send stamp for paper "Machinery & Supplies."* W. P. Davis, Rochester, N. Y.

ARTIFICIAL LIMBS
Free Catalog. Geo. R. Fuller, Box 2150, Rochester, N. Y.

JESSOP'S STEEL THE VERY BEST FOR TOOLS, SAWS ETC.
Wm JESSOP & SONS Ltd 91 JOHN ST. NEW YORK

At ¼ Price Bicycles, Watches Guns, Buggies Harness, Sewing Machines Organs, Pianos Safes, Tools Scales of all varieties and 1000 other articles. Lists free. CHICAGO SCALE CO., Chicago, Ill.

NUT LOCK Patent No. 421,358 for sale. Guaranteed the best one ever invented. McDonah & Croffut, 157 Court St., Binghamton, N. Y.

- - THE - -

SCIENTIFIC AMERICAN

☞ ESTABLISHED 1845.

The Most Popular Scientific Paper in the World

Only $3.00 a Year, Including Postage.

Weekly--52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc. Complete list of Patents each week.

Terms of Subscription.—One copy of the SCIENTIFIC AMERICAN will be sent for *one year*—52 numbers—postage prepaid, to any subscriber in the United States, Canada, or Mexico, on receipt of **Three Dollars** by the publishers; six months, $1.50; three months, $1.00.

Clubs.—Special rates for several names, and to Postmasters. Write for particulars.

The safest way to remit is by Postal Order, Draft, or Express Money Order. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO., 361 Broadway, New York.

Scientific American Supplement

This is a separate and distinct publication from THE SCIENTIFIC AMERICAN, but is uniform therewith in size, every number containing sixteen large pages full of engravings, many of which are taken from foreign papers and accompanied with translated descriptions. THE SCIENTIFIC AMERICAN SUPPLEMENT is published weekly, and includes a very wide range of contents. It presents the most recent papers by eminent writers in all the principal departments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy, Natural History, Geography, Archæology, Astronomy, Chemistry, Electricity, Light, Heat, Mechanical Engineering, Steam and Railway Engineering, Mining, Ship Building, Marine Engineering, Photography, Technology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economy, Biography, Medicine, etc. A vast amount of fresh and valuable information obtainable in no other publication.

The most important Engineering Works, Mechanisms, and Manufactures at home and abroad are illustrated and described in the SUPPLEMENT.

Price for the SUPPLEMENT, for the United States, Canada, and Mexico, $5.00 a year; or one copy of the SCIENTIFIC AMERICAN and one copy of the SUPPLEMENT, both mailed for one year to one address for $7.00. Single copies, 10 cents. Address and remit by postal order, express money order, or check,

MUNN & CO., 361 Broadway, New York.

Building Edition.

THE SCIENTIFIC AMERICAN BUILDING EDITION is issued monthly. $2.50 a year. Single copies, 25 cents. Thirty-two large quarto pages, forming a large and splendid Magazine of Architecture, richly adorned with *elegant plates* and other fine engravings; illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with Floor Plans, Descriptions, Locations, Estimated Cost, etc.

The elegance and cheapness of this magnificent work have won for it the **Largest Circulation** of any Architectural publication in the world. Sold by all newsdealers. $2.50 a year. Remit to

MUNN & CO., 361 Broadway, New York.

Export Edition

of the SCIENTIFIC AMERICAN, with which is incorporated "LA AMERICA CIENTIFICA E INDUSTRIAL," or Spanish edition of the SCIENTIFIC AMERICAN is published monthly, and is uniform in size and typography with the SCIENTIFIC AMERICAN. Every number contains about 50 pages, profusely illustrated. It is the finest scientific, industrial export paper published. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. THE SCIENTIFIC AMERICAN EXPORT EDITION has a large guaranteed circulation in all commercial places *throughout the world*. $3.00 a year, postpaid, to any part of the world. Single copies, 25 cents.

☞ Manufacturers and others who desire to secure foreign trade may have large and handsomely displayed announcements published in this edition at a very moderate cost. Rates upon application.

MUNN & CO., Publishers,
361 Broadway, New York.

PRINTING OUTFITS Send 10c. for Catalogues.
Machinery, Tools, Inks and Type.
GOLDING & CO., 179 Ft. Hill Sq., Boston, Mass.

PRINTING INKS.
The SCIENTIFIC AMERICAN is printed with CHAS. ENEU JOHNSON & CO.'S INK, Tenth and Lombard Sts., Philadelphia, and 47 Rose St., opp. Duane, New York

© 1895 SCIENTIFIC AMERICAN, INC.